Missile Defense Agency
Mobile Launch Platform (MLP)

Draft Environmental Assessment

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Department of Defense
Missile Defense Agency
7100 Defense Pentagon
Washington, DC 20301-7100

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
Al_2O_3	Aluminum oxide
BMDS	Ballistic Missile Defense System
BOA	Broad Ocean Area
BRAC	Base Realignment and Closure
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COSIP	Coherent Signal Processor
DoD	Department of Defense
DOT	Department of Transportation
EA	Environmental Assessment
EED	Electro-explosive Device
EIS	Environmental Impact Statement
EMR	Electromagnetic Radiation
EO	Executive Order
ESQD	Explosive Safety Quantity-Distance
FAA	Federal Aviation Administration
FTS	Flight Termination System
HIHWNMS	Hawaiian Islands Humpback Whale National Marine Sanctuary
HCl	Hydrogen chloride
IFT	Integrated Flight Test
IRFNA	Inhibited Red Fuming Nitric Acid
ISTEF	Innovative Science and Technology Experimentation Facility
JP	Jet Propellant
KTF	Kauai Test Facility
LHA	Launch Hazard Area
MDA	Missile Defense Agency
MLP	Mobile Launch Platform
MMH	Monomethylhydrazine
MWIR	Mid-Wavelength Infrared
MRSS	Mobile Range Safety Systems
NO_x	Nitrogen oxide
N_2O_4	Nitrogen tetroxide
NEPA	National Environmental Policy Act
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
OSHA	Occupational Safety and Health Administration
PAC	PATRIOT Advanced Capability
PM	Particulate Matter
PMRF	Pacific Missile Range Facility

RTS	Ronald Reagan Ballistic Missile Defense Test Site (Reagan Test Site)
SHOTS	Stabilized High-Accuracy Optical Tracking System
THAAD	Terminal High Altitude Area Defense*
TTS	Transportable Telemetry System
UDMH	Unsymmetrical dimethylhydrazine
UNDS	Uniform National Discharge Standards
U.S.	United States
USAKA	U.S. Army Kwajalein Atoll
VSAT	Very Small Aperture Terminal

*Formerly Theater High Altitude Area Defense, redesignated Terminal High Altitude Area Defense February 2004

EXECUTIVE SUMMARY

Introduction

The National Environmental Policy Act (NEPA) of 1969, as amended; the Council on Environmental Quality (CEQ) regulations which implement NEPA (Code of Federal Regulations [CFR], Title 40, Parts 1500-1508); Department of Defense (DoD) Instruction 4715.9 *Environmental Planning and Analysis*; applicable service environmental regulations that implement these laws and regulations; and Executive Order (E.O.) 12114, *Environmental Effects Abroad of Major Federal Actions* direct DoD lead agency officials to consider potential environmental impacts and consequences when authorizing or approving Federal actions. E.O. 12114 requires environmental consideration for actions that may significantly affect the environment outside United States (U.S.) Territorial Waters.

This Environmental Assessment (EA) evaluates the potential environmental impacts of activities associated with using the existing Mobile Launch Platform (MLP) as a platform for testing sensors, launching target missiles, and launching interceptor missiles. This EA considers the impacts of specific tests that propose to use the MLP. Other future uses of the MLP that have not been developed at this time would need to be considered in subsequent NEPA analyses. This EA will also consider cumulative impacts associated with test events using the MLP. This EA is being prepared to determine whether the impacts of the proposed action are significant impacts that would require the preparation of an Environmental Impact Statement (EIS).

Purpose and Need for the Proposed Action

The purpose of the proposed action is to provide a mobile sea-based platform from which to more realistically test sensors (radars, telemetry, and optical systems), ballistic missile targets and defense missile interceptors in support of the Missile Defense Agency's (MDA's) mission. The MDA has a requirement to develop, test, deploy, and prepare for decommissioning a Ballistic Missile Defense System (BMDS) to provide a defensive capability for the U.S., its deployed forces, friends, and allies from ballistic missile threats. The MDA needs to use realistic launch trajectories to test the BMDS. The proposed action would provide the MDA with the capability to conduct launches using multiple realistic target and interceptor trajectories in existing test ranges and the Broad Ocean Area (BOA). In addition, the MLP would provide MDA the capability to use sensors at test support positions in remote areas of the ocean by locating these sensors on the MLP.

Proposed Action

The MDA proposes to use the existing MLP to provide a mobile sea-based platform from which to test sensors (radars, telemetry, and optical systems), ballistic missile targets, and defensive missile interceptors in support of MDA's mission. The MLP is the former USS Tripoli (LPH 10), a converted U.S. Navy Iwo Jima Class Amphibious Assault Ship (Helicopter). Missiles proposed for launch from the MLP include pre-fueled and non-pre-fueled liquid propellant target missiles, solid propellant target missiles, and solid propellant interceptor missiles. Tests would consist of the launch of a target missile; tracking by range and other land-based, sea-based, air-based, and space-based sensors; launch of an interceptor missile; target intercept; and debris impacting in the BOA. For the purpose of this EA, a test event represents a target missile flight, an interceptor missile flight, an intercept of a target missile, or use of a sensor to observe a missile flight test or intercept. It is anticipated that the MDA would conduct up to four test events per year using the MLP as a platform for operating sensors, launches of target missiles, and launches of interceptor missiles for a total of up to 20 test events between 2004 and 2009.

The sensors that would be tested from the MLP include radar, telemetry, and optical systems. Examples of radars that would be used include: TPS-X, Mk-74, and Coherent Signal Processor radars that already exist, and the BMDS radar, being developed by the MDA. Telemetry systems could include the Transportable Telemetry System and mobile range safety systems. Mobile optical systems such as the Stabilized High-Accuracy Optical Tracking System could also be placed on the MLP. Additional sensor systems may be temporarily based on the MLP as required. The targets that would be launched from the MLP include: pre-fueled and non-pre-fueled liquid propellant missiles and solid propellant missiles. The interceptors would be designed to operate onboard the MLP from one or all of the following locations, Western Range[1], Pacific Missile Range Facility (PMRF), U.S. Army Kwajalein Atoll (USAKA)/Ronald Reagan Ballistic Missile Defense Test Site (RTS), and the BOA.

Proposed Alternatives

Two alternatives to the proposed action have been identified and will be considered in this EA. These alternatives are

Alternative 1 - using the MLP for the launch of all missile types (pre-fueled and non pre-fueled liquid propellant target missiles, solid propellant target missiles, and solid propellant interceptor missiles) but not for testing sensors.

[1] For purposes of this EA, the Western Range would include the Point Mugu Sea Range.

Alternative 2 - using the MLP to test sensors and launch pre-fueled liquid propellant missiles and solid propellant missiles but not non-pre-fueled liquid propellant missiles.

No Action Alternative

Under the no action alternative, existing activities to be conducted from the MLP would continue and additional activities using the MLP would be considered on a case-by-case basis. Sensor tests and missile launches would continue from existing locations and facilities however, aside from use for specific tests considered on a case-by-case basis, the MDA would not have the flexibility of using the MLP as a platform to conduct testing of sensors or launches of missiles from the MLP. The potential benefits to the testing program from implementing realistic flight-test scenarios and the greater flexibility afforded with a mobile platform would not be realized.

Methodology

To assess the significance of any impact, a list of activities necessary to accomplish the Proposed Action was developed. The affected environment at all applicable locations was then described. Next those activities with the potential for environmental consequences were identified. The degree of analysis of proposed activities is proportionate to their potential to cause environmental impacts. Within each resource area, the impacts of activities associated with missile launches and sensor use were examined.

Missile Test Events

For the purposes of this EA it was assumed that there are three types of activities associated with launching missiles from the MLP that could have impacts on the environment. These activities include pre-launch, launch, and post-launch activities. Specific actions associated with these activities are as follows.

Pre-launch Activities. Pre-launch activities include transporting missiles and propellants to the ordnance loading port and transporting the MLP from the ordnance loading port to the test event location. The test event sponsor would be responsible for coordinating airspace use and Notices to Airmen (NOTAMs) and Notices to Mariners (NOTMARs) may be required to notify people in the affected area that missile launch activities are scheduled from the MLP.

If it were necessary to fuel the missile on the MLP, fueling would take place over a period of several days. It is anticipated that only very small amounts of oxidizer vapors or fuel vapors would be released into the atmosphere during propellant transfer operations. All fueling would be conducted using impermeable barriers appropriate for this type of activity. Other preparation activities including adding fins to the missile and elevating the missile to the appropriate launch angle would be included as part of pre-launch activities.

Launch Activities. Launch activities would include the ignition of rocket motors. To launch missiles from the MLP it might be necessary to establish a temporary warning area. Only a small portion of the launch exhaust and launch-related noise would occur near the test event location. Launch activities would also include the flight of missiles along the flight path and deposition of boosters in designated impact areas, if necessary. Missiles would also have a flight termination system (FTS) that would be used to terminate the flight of the missile if it moved outside of the established flight parameters. Impact zones for test events would be delineated based on detailed launch planning and trajectory modeling. Launches would be conducted when trajectory modeling verifies that flight vehicles and debris would be contained within predetermined areas.

As a result of successful intercepts, there would be debris comprised of both the target and interceptor missile. The impact footprint is determined by considering the limits of debris fallout based on destruction of a test missile at the boundaries of the acceptable flight corridor, along with additional flight time outside the acceptable flight corridor based on the time required to initiate the FTS.

Post-launch Activities. Post-launch activities would involve a visual inspection of the deck area and collection of debris on the deck. Debris would be disposed of in accordance with applicable regulations including the International Convention for the Prevention of Pollution or brought back to port for disposal. The MLP would be transported from the test event location to the ordnance loading port or home port as appropriate.

Sensor Test Events

For purposes of this impacts analysis it was assumed that there are three types of activities associated with using sensors on the MLP that could have impacts on the environment. These activities are pre-operational, operational, and post-operational activities, and what they entail is described as follows.

Pre-Operational. Pre-operational activities include transporting the sensor to the home port and loading sensor equipment on the MLP. The test event sponsor would be responsible for coordinating airspace use. NOTAMs and NOTMARs may be required to notify people in the affected area that sensors are planned for use in the area. Other preparation activities include equipment set-up and maintenance of sensor systems.

Operational. During transport of the MLP it may be necessary to conduct in-transit use of the sensors for calibration purposes. In some instances the two generators on the MLP may be sufficient to power necessary on-board systems and the sensors, but in other cases it would be necessary to use supplemental generators to power the sensor. Operational activities also include the use of the sensor to support the test event.

Post-Operational. Post operational activities for sensors would include general maintenance and ensuring that the equipment is secure for moving the MLP from the test event location to the home port. Sensors would not be tested or calibrated while moving the MLP from the test event location to the home port. Once at the home port, the sensor and any associated equipment would be unloaded.

Summary of Environmental Impacts

This section summarizes the conclusions of the analyses based on the application of the described methodology. Within each resource summary, only those activities for which a potential environmental concern was identified are described. A summary of potential environmental effects from missile test events is provided in Table ES-1 and a summary of potential environmental effects from sensor test events is provided in Table ES-2.

Mare Island

There would be no changes required to Mare Island to support docking, servicing, or maintaining the MLP. In addition, any impacts resulting from generator use aboard the MLP would not be different than vessels currently using the port, thus no significant impacts are expected from the use of the MLP at Mare Island. Radars on the MLP would radiate at the home port for system testing, calibration, and tracking of satellites. With the implementation of software controls and other operating parameters, there would be no radiation hazard area on the shore at the home port. Thus, no impacts are expected to the home port from using radars on the MLP.

Cumulative Impacts from Missile Test Events

Because the proposed activities would take place in the open ocean, no major differences are expected to the cumulative impacts between ranges. There are no other known activities in the near shore environment or BOA that would contribute to cumulative impacts in the open ocean, therefore this cumulative impacts analysis focuses on the cumulative impacts of up to four missile test events per year. Proposed missile launches from the MLP in conjunction with other existing activities would not be expected to produce cumulative impacts.

Missile launches are short-term, discrete events, allowing time between launches for emissions to be dispersed. Thus, no cumulative impacts would be expected to air quality. Because the volume of air traffic using the open ocean environment is within structured airspace with scheduling procedures in place for jet routes and warning and control areas, there would be no cumulative impacts to airspace scheduling or use.

Use of spill prevention, containment, and control measures would prevent or minimize impacts to biological resources from spills of propellants. Noise impacts may elicit behavioral disturbance responses in wildlife; however, the addition of at most four missile-launches per year would have no cumulative effects. The deck of the MLP would be hardened to protect personnel during launch operations and personnel would be required to wear appropriate hearing protection.

Cumulative Impacts from Sensor Test Events

There are no other known activities in the near shore environment or BOA that would contribute to cumulative impacts in the open ocean, therefore this analysis focuses on the impacts of up to four sensor test events per year. In instances where two radars are used together, for example if the Mk-74 is given a vector to track a target by another radar, such as the TPS-X, no additional impacts would be expected since Mk-74 support equipment would be powered by the generators on the MLP and would not require the addition of supplemental generators. This EA considers the impacts of operating sensors singly or in groups from the MLP. Power requirements for each sensor are discussed in the EA and may be modified by the test event sponsor based on the specific mission proposed. Therefore, the impacts from using two sensors on the MLP would be similar to those discussed below.

Sensor operating areas would be restricted to minimize impacts to aircraft operations. Standards developed by the Federal Aviation Administration (FAA) and DoD, which limit electromagnetic radiation (EMR) interference to aircraft, would preclude potential cumulative impacts to airspace. EMR hazard zones and safety procedures would be established to ensure the safety of personnel aboard the MLP, and thus there would be no cumulative impacts to health and safety.

There would be no expected cumulative impacts to air quality, biological resources, geology and soils, noise, transportation and infrastructure, or water resources from the proposed action. No cumulative impacts would result from hazardous materials used or hazardous waste produced as a result of the proposed action. Operational noises from sensor test events would be limited to the generator used on the MLP and would not be different from current marine vessels; no significant cumulative noise impacts would be expected.

Table ES-1. Summary of Environmental Impacts from Missile Test Events

Resource Area	Western Range	Pacific Missile Range Facility	USAKA/RTS	Broad Ocean Area
Air Quality	Fueling missiles would result in less than significant impacts to air quality. Use of additional generators would not exceed Federal de minimis levels. Emissions from launches would be quickly dispersed by wind and would not significantly affect air quality.	Fueling missiles would result in less than significant impacts to air quality. Use of additional generators would not exceed Federal de minimis levels. Emissions from launches would be quickly dispersed by wind and would not significantly affect air quality.	Fueling missiles would result in less than significant impacts to air quality. Emissions from launches would be quickly dispersed by wind and would not significantly affect air quality.	Fueling missiles would result in less than significant impacts to air quality. Emissions from launches would be quickly dispersed by wind and would not significantly affect air quality.
Airspace	Following required scheduling and coordination procedures and issuing NOTAMs would reduce potential impacts to airspace below significant levels.	Following required scheduling and coordination procedures and issuing NOTAMs would reduce potential impacts to airspace below significant levels.	Following required scheduling and coordination procedures and issuing NOTAMs would reduce potential impacts to airspace below significant levels.	Following required scheduling and coordination procedures and issuing NOTAMs would reduce potential impacts to airspace below significant levels.
Biological Resources	Spill prevention measures would reduce the potential for impacts to biological resources from spills. Noise from launches can induce startle reactions in marine wildlife; however, launches are relatively infrequent events. Missiles impacting the ocean surface could injure marine animals; however, fewer than 0.0006 marine animals would be exposed per year.	Spill prevention measures would reduce the potential for impacts to biological resources from spills. Noise from launches can induce startle reactions in marine wildlife; however, launches are relatively infrequent events. Impacts to submerged barrier reefs may occur when a missile impacts the ocean, to the extent possible the impact area would be limited to deep-water areas, which would reduce the potential for impact to reefs.	Spill prevention measures would reduce the potential for impacts to biological resources from spills. Noise from launches can induce startle reactions in marine wildlife; however, launches are relatively infrequent events. Impacts to submerged barrier reefs may occur when a missile impacts the ocean, to the extent possible the impact area would be limited to deep-water areas, which would reduce the potential for impact to reefs.	Spill prevention measures would reduce the potential for impacts to biological resources from spills. Noise from launches can induce startle reactions in marine wildlife; however, launches are relatively infrequent events. Missiles impacting the ocean surface could injure marine animals; however, the density of marine animals and the corresponding probability of impact decrease, as the distance from the shore increases.
Geology and Soils	Launches may require evacuation or sheltering of offshore oil platforms but would not impact petroleum reserves. No impact to geology and soils would be expected from fueling or launch operations.	No impact to geology and soils would be expected from fueling or launch operations.	No impact to geology and soils would be expected from fueling or launch operations.	No impact to geology and soils would be expected from fueling or launch operations.

Table ES-1. Summary of Environmental Impacts from Missile Test Events

Resource Area	Western Range	Pacific Missile Range Facility	USAKA/RTS	Broad Ocean Area
Hazardous Materials and Hazardous Waste	Applicable regulations and procedures would be followed and prevent impacts from hazardous materials or hazardous waste.	Applicable regulations and procedures would be followed and prevent impacts from hazardous materials or hazardous waste.	Applicable regulations and procedures would be followed and prevent impacts from hazardous materials or hazardous waste.	Applicable regulations and procedures would be followed and prevent impacts from hazardous materials or hazardous waste.
Health and Safety	Launch related personnel and workers on offshore oil platforms would be protected from hazards related to launch events. Test events would take place in ocean areas removed from the public. Therefore, no impacts to health and safety would be expected.	Launch related personnel would be protected from hazards related to launch events. Test events would take place in ocean areas removed from the public. Therefore, no impacts to health and safety would be expected.	Launch related personnel would be protected from hazards related to launch events. Test events would take place in ocean areas removed from the public. Therefore, no impacts to health and safety would be expected.	Launch related personnel would be protected from hazards related to launch events. Test events would take place in ocean areas removed from the public. Therefore, no impacts to health and safety would be expected.
Noise	Infrequent noise and sonic booms associated with launches would not interfere with other activities. Launch personnel would be protected from noise either by being removed from the area or by wearing hearing protection.	Infrequent noise and sonic booms associated with launches would not interfere with other activities. Launch personnel would be protected from noise either by being removed from the area or by wearing hearing protection.	Infrequent noise and sonic booms associated with launches would not interfere with other activities. Launch personnel would be protected from noise either by being removed from the area or by wearing hearing protection.	Infrequent noise and sonic booms associated with launches would not interfere with other activities. Launch personnel would be protected from noise either by being removed from the area or by wearing hearing protection.
Transportation and Infrastructure	Transportation of missiles and propellants to the ordnance loading location would not impact ground, sea, or air transportation at the port or surrounding area. NOTAMs and NOTMARs would provide sufficient warning to other traffic to select routes that would not be impacted by test events.	Transportation of missiles and propellants to the ordnance loading location would not impact ground, sea, or air transportation at the port or surrounding area. NOTAMs and NOTMARs would provide sufficient waming to other traffic to select routes that would not be impacted by test events.	Transportation of missiles and propellants to the ordnance loading location would not impact ground, sea, or air transportation at the port or surrounding area. NOTAMs and NOTMARs would provide sufficient warning to other traffic to select routes that would not be impacted by test events.	Transportation of missiles and propellants to the ordnance loading location would not impact ground, sea, or air transportation at the port or surrounding area. NOTAMs and NOTMARs would provide sufficient warning to other traffic to select routes that would not be impacted by test events.
Water Resources	Releases of propellants to the marine environment would be diluted in water and would not be expected to cause significant impact to biological resources or water quality.	Releases of propellants to the marine environment would be diluted in water and would not be expected to cause significant impact to biological resources or water quality.	Releases of propellants to the marine environment would be diluted in water and would not be expected to cause significant impact to biological resources or water quality.	Releases of propellants to the marine environment would be diluted in water and would not be expected to cause significant impact to biological resources or water quality.

Table ES-2. Summary of Environmental Impacts from Sensor Test Events

Resource Area	Western Range	Pacific Missile Range Facility	USAKA/RTS	Broad Ocean Area
Air Quality	Emissions would be limited to generator emissions. Existing and supplemental generators would produce emissions below de minimis levels and would not exceed NAAQS.	Emissions would be limited to generator emissions. Existing and supplemental generators would produce emissions below de minimis levels and would not exceed NAAQS.	Emissions would be limited to generator emissions. Existing and supplemental generators would produce emissions with less than significant impacts on air quality.	Emissions would be limited to generator emissions. Existing and supplemental generators would produce emissions with less than significant impacts on air quality.
Airspace	Following required scheduling and coordination procedures and issuing NOTAMs would reduce potential impacts to airspace below significant levels. Radars would be programmed to limit radio frequency emissions in the direction of airways within potential interference distances.	Following required scheduling and coordination procedures and issuing NOTAMs would reduce potential impacts to airspace below significant levels. Radars would be programmed to limit radio frequency emissions in the direction of airways within potential interference distances.	Following required scheduling and coordination procedures and issuing NOTAMs would reduce potential impacts to airspace below significant levels. Radars would be programmed to limit radio frequency emissions in the direction of airways within potential interference distances.	Following required scheduling and coordination procedures and issuing NOTAMs would reduce potential impacts to airspace below significant levels. Radars would be programmed to limit radio frequency emissions in the direction of airways within potential interference distances.
Biological Resources	Migratory species of birds could strike antennas, telescopes, and shelters or become disoriented by high intensity lighting. To minimize impacts, antennas would be raised only when necessary and would have colorful streamers to warn birds. High intensity lighting would be used only when necessary. Because the radar beam is in motion, no impacts to species are expected from EMR. Radar beams would not be propagated towards the ocean.	Migratory species of birds could strike antennas, telescopes, and shelters or become disoriented by high intensity lighting. To minimize impacts, antennas would be raised only when necessary and would have colorful streamers to warn birds. High intensity lighting would be used only when necessary. Because the radar beam is in motion, no impacts to species are expected from EMR. Radar beams would not be propagated towards the ocean	Migratory species of birds could strike antennas, telescopes, and shelters or become disoriented by high intensity lighting. To minimize impacts, antennas would be raised only when necessary and would have colorful streamers to warn birds. High intensity lighting would be used only when necessary. Because the radar beam is in motion, no impacts to species are expected from EMR. Radar beams would not be propagated towards the ocean.	Migratory species of birds could strike antennas, telescopes, and shelters or become disoriented by high intensity lighting. To minimize impacts, antennas would be raised only when necessary and would have colorful streamers to warn birds. High intensity lighting would be used only when necessary. Because the radar beam is in motion, no impacts to species are expected from EMR. Radar beams would not be propagated towards the ocean
Geology and Soils	No impact to geology and soils would be expected from activation of sensors.	No impact to geology and soils would be expected from activation of sensors.	No impact to geology and soils would be expected from activation of sensors.	No impact to geology and soils would be expected from activation of sensors.

Table ES-2. Summary of Environmental Impacts from Sensor Test Events

Resource Area	Western Range	Pacific Missile Range Facility	USAKA/RTS	Broad Ocean Area
Hazardous Materials and Hazardous Waste	Applicable regulations and procedures would be followed and would prevent impacts from hazardous materials or hazardous waste.	Applicable regulations and procedures would be followed and would prevent impacts from hazardous materials or hazardous waste.	Applicable regulations and procedures would be followed and would prevent impacts from hazardous materials or hazardous waste.	Applicable regulations and procedures would be followed and would prevent impacts from hazardous materials or hazardous waste.
Health and Safety	Personnel would be protected from hazards related to activation of sensors. Test events would take place in the ocean in areas removed from the public. Therefore, no impacts to health and safety would be expected.	Personnel would be protected from hazards related to activation of sensors. Test events would take place in the ocean in areas removed from the public. Therefore, no impacts to health and safety would be expected.	Personnel would be protected from hazards related to activation of sensors. Test events would take place in the ocean in areas removed from the public. Therefore, no impacts to health and safety would be expected.	Personnel would be protected from hazards related to activation of sensors. Test events would take place in the ocean in areas removed from the public. Therefore, no impacts to health and safety would be expected.
Noise	The operation of generators from the MLP may cause marine animals to avoid the area. Backup generators would use noise-dampening shrouds that would reduce the potential for impact from noise.	The operation of generators from the MLP may cause marine animals to avoid the area. Backup generators would use noise-dampening shrouds that would reduce the potential for impact from noise	The operation of generators from the MLP may cause marine animals to avoid the area. Backup generators would use noise-dampening shrouds that would reduce the potential for impact from noise	The operation of generators from the MLP may cause marine animals to avoid the area. Backup generators would use noise-dampening shrouds that would reduce the potential for impact from noise
Transportation and Infrastructure	NOTAMs and NOTMARs would provide sufficient warning to other marine traffic to select routes that would not be impacted by test events.	NOTAMs and NOTMARs would provide sufficient warning to other marine traffic to select routes that would not be impacted by test events.	NOTAMs and NOTMARs would provide sufficient warning to other marine traffic to select routes that would not be impacted by test events.	NOTAMs and NOTMARs would provide sufficient warning to other marine traffic to select routes that would not be impacted by test events.
Water Resources	There is a potential for impacts to water quality from a diesel spill due to the operation of generators. Any release to ocean water would be diluted rapidly. Therefore, any release would be expected to have minimal impacts to water quality.	There is a potential for impacts to water quality from a diesel spill due to the operation of generators. Any release to ocean water would be diluted rapidly. Therefore, any release would be expected to have minimal impacts to water quality.	There is a potential for impacts to water quality from a diesel spill due to the operation of generators. Any release to ocean water would be diluted rapidly. Therefore, any release would be expected to have minimal impacts to water quality.	There is a potential for impacts to water quality from a diesel spill due to the operation of generators. Any release to ocean water would be diluted rapidly. Therefore, any release would be expected to have minimal impacts to water quality.

1. INTRODUCTION

1.1 Background

The National Environmental Policy Act (NEPA) of 1969, as amended; the Council on Environmental Quality (CEQ) regulations which implement NEPA (Code of Federal Regulations [CFR], Title 40, Parts 1500-1508); Department of Defense (DoD) Instruction 4715.9 *Environmental Planning and Analysis*; applicable service environmental regulations that implement these laws and regulations; and Executive Order (E.O.) 12114, *Environmental Effects Abroad of Major Federal Actions* direct DoD lead agency officials to consider potential environmental impacts and consequences when authorizing or approving Federal actions. E.O. 12114 requires environmental consideration for actions that may significantly affect the environment outside the United States (U.S.) Territorial Waters.

This Environmental Assessment (EA) evaluates the potential environmental impacts of activities associated with using the existing Mobile Launch Platform (MLP) as a platform for testing sensors, launching target missiles, and launching interceptor missiles. This EA considers the impacts of specific tests that propose to use the MLP. Some specific tests have been proposed for the MLP and are described in Section 2.3. Other proposed future tests that have impacts that are within the parameters of those discussed in this EA may rely on the analysis in this document, as appropriate. This EA will also consider cumulative impacts associated with test events using the MLP. This EA is being prepared to determine whether the impacts of the proposed action are significant impacts that would require the preparation of an Environmental Impact Statement (EIS).

1.2 Purpose

The purpose of the proposed action is to provide a mobile sea-based platform from which to more realistically test sensors (radars, telemetry, and optical systems), ballistic missile targets, and defensive missile interceptors in support of the Missile Defense Agency (MDA) mission.

1.3 Need

The MDA has a requirement to develop, test, deploy, and prepare for decommissioning a Ballistic Missile Defense System (BMDS) to provide a defensive capability for the U.S., its deployed forces, friends, and allies from ballistic missile threats. The MDA has a need to use realistic launch trajectories to test the BMDS. The proposed action would provide the MDA with the capability to conduct launches using multiple realistic target and interceptor trajectories in existing test ranges and the Broad Ocean Area (BOA). In addition, the proposed action would allow MDA the capability to use sensors at test support positions in remote areas of the ocean by locating these sensors on the MLP.

1.4 Scope of Analysis

This EA will consider the proposed use of the MLP as a mobile sea-based platform to conduct MDA activities that would support the testing of the BMDS. This document will summarize existing analyses of the missiles and sensors in the ranges and BOA considered in the proposed action or alternatives.

This EA will address the potential impacts of

- Minor modifications to the MLP to support the testing of sensors and the launch of non-pre-fueled liquid propellant missiles and solid propellant missiles;[2]
- Transporting sensors to the home port of the MLP, Mare Island, California;
- Transporting target and interceptor missiles and their associated propellants to ordnance loading ports including Concord Army Terminal, California; Port of Oakland/U.S. Navy Fleet and Industrial Supply Center, California; U.S. Naval Weapons Station Seal Beach, California; and U.S. Naval Station Pearl Harbor, Hawaii;
- Set up and check out of components put onboard at the home port (e.g., radar testing at home port as part of initial installation at a power level determined by the local frequency coordinator, maintenance activities at low power, and calibration using satellites at full power);
- Missile fueling on board the MLP at the ordnance loading port or at sea;
- Towing the MLP to the proposed test location;
- Safety of personnel on the MLP and tow vessel; and
- Waste disposal.

The sensors that would be tested from the MLP include radars, telemetry, and optical systems. Examples of radars that could be used include: TPS-X, Mk-74, and Coherent Signal Processor (COSIP) radars that already exist, and the BMDS radar, being developed by the MDA. Telemetry systems could include the Transportable Telemetry System (TTS) and mobile range safety systems. Mobile optical systems such as the Stabilized High-Accuracy Optical Tracking System (SHOTS) could also be placed on the MLP. Additional sensor systems may be temporarily based on the MLP as required. The targets that would be launched from the MLP include: pre-fueled and non-pre-fueled liquid propellant missiles and solid propellant missiles. The interceptors that would be launched from the MLP include solid propellant missiles. The MLP would be designed to operate

[2] Minor modifications have already been performed on the MLP to support the use of pre-fueled liquid propellant missiles.

from one or all of the following locations, Western Range[3], Pacific Missile Range Facility (PMRF), U.S. Army Kwajalein Atoll (USAKA)/Ronald Reagan Ballistic Missile Defense Test Site (RTS), and the BOA.

1.5 Related Environmental Documentation

The NEPA analyses identified below have been incorporated by reference and impact determinations have been summarized, as appropriate, in this document.

- Cortez III Environmental, 1996. *Lance Missile Target Environmental Assessment.*
- Missile Defense Agency, 2003. *Record of Environmental Consideration Use of Mobile Range Safety System on Midway Island*, July.
- U.S. Army Space and Missile Defense Command, 2002. *PATRIOT Advanced Capability (PAC)-3 Life-Cycle Supplemental Environmental Assessment*, January.
- U.S. Army Space and Missile Defense Command, 2002. *Liquid Propellant Missile Site Preparation and Launch Environmental Assessment*, May.
- U.S. Army Space and Missile Defense Command, 2002. *Theater High Altitude Area Defense (THAAD) Pacific Test Flights Environmental Assessment*, December.
- U.S. Army Space and Missile Defense Command, 2003. *Ground-Based Midcourse Defense Extended Test Range Environmental Impact Statement*, July.
- U.S. Army Space and Missile Defense Command, 2003. *Arrow System Improvement Program Environmental Assessment*, October.
- U.S. Army Space and Strategic Defense Command, 1990. *PATRIOT Life-Cycle Environmental Assessment*, December.
- U.S. Army Space and Strategic Defense Command, 1993. *Supplemental Environmental Impact Statement, Proposed Actions at U.S. Army Kwajalein Atoll*, December.

[3] For purposes of this EA, the Western Range would include the Point Mugu Sea Range.

- U.S. Army Space and Strategic Defense Command, 1994. *Theater Missile Defense Extended Test Range Final Environmental Impact Statement*, November.

- U.S. Army Space and Strategic Defense Command, 1995. *Army Mountain Top Experiment Environmental Assessment*, May.

- U.S. Army Space and Strategic Defense Command, 1995. *U.S. Army Kwajalein Atoll Temporary Extended Test Range Environmental Assessment*, October.

- U.S. Army Space and Strategic Defense Command, 1997. *PATRIOT Advanced Capability (PAC)-3 Life-Cycle Environmental Assessment*, May.

- U.S. Army Strategic Defense Command, 1989. *Final Environmental Impact Statement: Proposed Actions at U.S. Army Kwajalein Atoll*, October.

- U.S. Navy, 1998. *Pacific Missile Range Facility Enhanced Capability Final Environmental Impact Statement*, December.

- U.S. Navy, 2002. *Point Mugu Sea Range Final Environmental Impact Statement/Overseas Environmental Impact Statement*, March.

2. *DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES*

2.1 Proposed Action/Preferred Alternative

The MDA proposes to use the existing MLP to provide a mobile sea-based platform from which to test sensors (radars, telemetry, and optical systems), ballistic missile targets and defensive missile interceptors in support of MDA's mission. Missiles proposed for launch from the MLP include pre-fueled and non-pre-fueled liquid propellant target missiles, solid propellant target missiles, and solid propellant interceptor missiles. Tests would consist of the launch of a target missile; tracking by range and other land-, sea-, air-, and space-based sensors; launch of an interceptor missile; target intercept; and debris impacting in the BOA. For the purpose of this EA, a test event represents a target missile flight, an interceptor missile flight, an intercept of a target missile, or use of a sensor to observe a missile flight test or intercept. It is anticipated that the MDA would conduct up to four test events per year using the MLP as a platform for operating sensors, launches of target missiles, and launches of interceptor missiles for a total of up to 20 test events between 2004 and 2009.

Some specific tests have been proposed for the MLP as described in Section 2.3. Other proposed future tests that have impacts that are within the parameters of those discussed in this EA may rely on the analysis in this document, as appropriate. A range of scenarios for use of the MLP will be considered for analysis in this EA to ensure that reasonably foreseeable uses are analyzed; however, specific future activities not analyzed in this EA would need to be evaluated in subsequent NEPA analyses, as appropriate.

2.1.1 Mobile Launch Platform Description

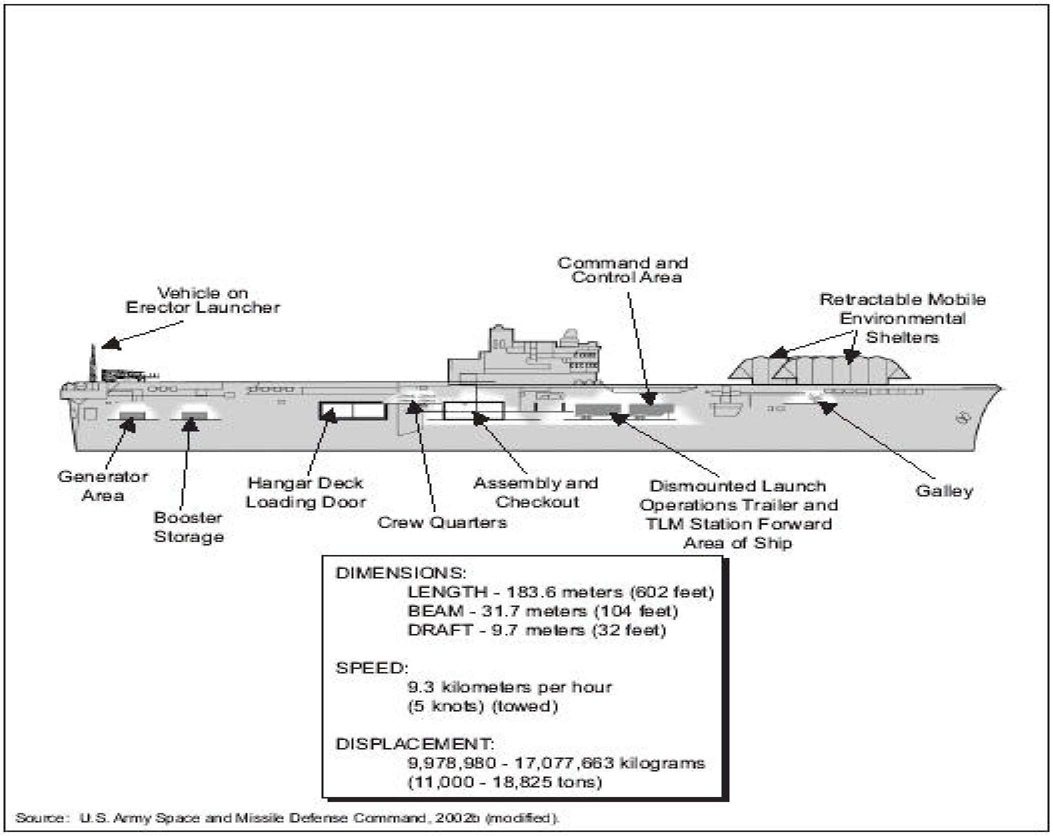
The MLP is the former USS Tripoli (LPH 10), a converted U.S. Navy Iwo Jima Class Amphibious Assault Ship (Helicopter) (see Figure 2-1). The U.S Army Space and Missile Defense Command currently leases the MLP from the U.S. Navy. The MDA provides funding for the operation and maintenance activities involving use of the MLP. The MLP is a free-floating platform and would not be anchored to the ocean floor during test events. Using the MLP would allow MDA greater flexibility in selecting launch trajectories to be used during testing and in selecting locations for testing sensors.

Figure 2-1. MLP (Former USS Tripoli)

The MLP was refurbished in 2002 and used to launch pre-fueled liquid propellant target missiles. As part of the refurbishment, two 750-kilowatt generators were installed to provide electricity to operate ship systems and various types of equipment (e.g., crane, missile launchers, etc.). A 250-kilowatt generator was also installed for use as an emergency power source in the event of a failure of the two 750-kilowatt generators. The 250-kilowatt generator is intended for use in emergencies, and therefore would not operate at the same time as the two 750-kilowatt generators. Missile launchers were attached to the flight deck using multiple deck tie-down points. The hardened deck of the MLP provides sufficient protection of personnel during test events; therefore, launch-related personnel would remain on-board during test events. Figure 2-2 shows the current configuration of the MLP.

The MLP is approximately 183 meters (602 feet) long, 32 meters (104 feet) wide, with a 9.7-meter (32-foot) draft. It has sufficient stowage capacity for missiles and palletized items. The MLP has quarters for 100 personnel, a full galley, and a control/operations room with communications and launch support equipment. The MLP would carry fresh water using both existing ship holding tanks and bottled drinking water. Wastewater would be held in existing ship holding tanks when the MLP is within the regulatory distance from the shore. The MLP would contain about 113,600 liters (30,000 gallons) of jet propellant (JP)-5 fuel for the on-board generators during a test event. It would also be stocked with about 1,041 liters (275 gallons) of lubricating oil, 15,140 liters (4,000 gallons) of hydraulic oil, and 379 liters (100 gallons) of antifreeze. These materials would be stored in tanks onboard the ship.

Figure 2-2. Current Configuration of the MLP



Source: U.S. Army Space and Missile Defense Command, 2002b (modified).

The MLP has no engines for propulsion and would be towed from port to the test event location. Either a government-owned contractor-operated or commercial tug would tow the MLP for test events (see Figure 2-3). Assist tug services, for docking and undocking, would be contracted to a commercial tug service. The towline connecting the MLP and the tow vessel would be of sufficient length for the tow vessel to be a safe distance from the MLP and the ships would be oriented so the missile flight would be away from the tow vessel.

The sensors would be transported to and loaded on the MLP at the home port and target and interceptor missiles would be transported to and loaded on the MLP at ordnance loading ports, using industrial transportation and loading practices meeting Federal, state and local regulatory and safety requirements. Possible in-transit docking locations for the MLP would include San Diego, California; Long Beach, California; Port Hueneme, California; Seal Beach, California; Oakland, California; Pearl Harbor, Hawaii; Seattle, Washington; and Everett, Washington.

Figure 2-3. Tow Vessel

Each test event would determine the limits of pitch and roll that would be allowed during testing based on its unique equipment configuration. The constraints would be such that no operations would be conducted in an unsafe manner. It is anticipated that most missile operations would take place in Sea State 4 or lower.[4] It is expected that sensor systems would be able to operate in Sea State 5 but each sensor system operator would make a test-specific determination.

2.1.2 Missile Description

Target and interceptor missiles, payloads, and support equipment would be transported by air, ship, or over-the-road common carrier truck from U.S. Government storage depots or contractor facilities, such as Hill Air Force Base (AFB), Utah; Thiokol Wasatch, Utah; Lockheed Martin, Huntsville, Alabama; Lincoln Laboratories, Massachusetts; Sandia National Lab, New Mexico; Chandler Orbital Facility, Arizona; and Coleman, Florida to the ordnance loading port, such as Concord Army Terminal, California; Port of Oakland/U.S. Navy Fleet and Industrial Supply Center, California; U.S. Naval Weapons Station Seal Beach, California; or U.S. Naval Station Pearl Harbor, Hawaii. All shipping would be conducted in accordance with Department of Transportation (DOT) regulations. Missiles would not be shipped with initiators or other explosive devices. Applicable safety regulations would be followed in the transport, receipt, storage, and handling of hazardous materials. Missile components would arrive at the ordnance loading port up to several weeks before a launch. Final assembly and checkout of the missiles would be accomplished on the MLP.

2.1.2.1 Target Missiles

Target missiles generally consist of one or more launch vehicles (boosters) and a payload. A booster may consist of one or more stages. A stage refers to the number of rocket motors that sequentially activate. Multiple stages may allow the missile to fly at higher velocities and altitudes, and for longer distances. A payload may include a target test object, guidance and control electronics, decoys and other countermeasures, simulants, and explosive material. A test object is any payload object that separates from the target system and emulates an offensive reentry vehicle. Target test objects typically consist of a steel housing assembly, thermal sensors, guidance and control electronics, radio transmitters and receivers, a power supply (which may include lithium or nickel-cadmium batteries) and hit instrumentation. The target missile would deliver the target test object in a variety of booster configurations.

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[4] Sea State refers to the Pierson-Moskowitz scale that categorizes the force of progressively higher wind speeds. (Usmilitary.about.com, 2003) A Sea State 4 corresponds to wind speeds between 18 and 20 knots; Sea State 5 corresponds to wind speeds between 21 and 25 knots; and a Sea State 6 corresponds to wind speeds between 27 and 33 knots. (U.S. Army Transportation Center and Fort Eustis, 2003)

Types of Targets

Types of target missiles to be launched from the MLP would include

- Pre-fueled liquid propellant targets,
- Non-pre-fueled liquid propellant targets, and
- Solid propellant targets.

Pre-fueled liquid propellant targets would be transported from various U.S. Government storage depots or contractor facilities to the ordnance loading port fully fueled. The pre-fueled liquid propellant missiles are single-stage missiles that are approximately 6.13 meters (20.2 feet) long. When fueled, the missile weighs approximately 1,146.9 kilograms (2,528.5 pounds). Upon arrival at the ordnance loading port, the propellants would be completely encapsulated in the missile. These missiles can be launched from and transported by a tracked self propelled vehicle or a special trailer. The trailer can be towed by a vehicle or lifted by helicopter. Final assembly and checkout of the missile would occur on the MLP.

Non-pre-fueled liquid propellant targets would be transported without the propellants loaded on the missile. The non-pre-fueled liquid propellant missiles may be fueled while the MLP is at the ordnance loading port or if necessary while the MLP is at sea. All fueling activities, regardless of whether the MLP is docked or at sea, would be accomplished in accordance with hazardous waste and spill contingency plans and standard operating procedures for health and safety that would be developed. No air or other permit requirements would be anticipated.

Non-pre-fueled liquid propellant missiles are approximately 11 meters (36 feet) long and have a diameter of 0.88 meter (2.9 feet). When fueled, the missile weighs approximately 5,865 kilograms (12,930 pounds). With the high explosive payload, the missile has a hazard classification of 1.1 (explosives that have a mass explosion hazard that is expected to mass-detonate when a small portion is initiated by any means). These missiles would use a flight termination system (FTS) that is activated by shutting off the flow of fuel, which terminates the missile's thrust. Support equipment normally associated with non-pre-fueled liquid propellant targets include a mobile launcher used to launch the missile, a truck mounted pad equipment shelter, a launch control van, propellant transfer system, and a propellant operation and staging trailer.

All personnel involved with propellant loading operations would wear appropriate personal protective equipment and would receive specialized training in liquid propellant safety, handling, spill containment, and cleanup procedures before handling the materials. These procedures would incorporate measures to minimize both the amount of waste propellants generated during transfer operations and the potential for accidental spills. The missile would be fully fueled just prior to launch.

The largest solid propellant targets that could be launched from the MLP would be two stage target missiles. These missiles would have a maximum length of 11.9 meters (39 feet) and would weigh 11,360 kilograms (25,045 pounds) when fully fueled. Solid propellant targets would be transported to the MLP ordnance loading port fully fueled. Final assembly and checkout of the missile would occur on the MLP. Target missiles proposed for launch from the MLP would include, but may not be limited to, missiles using Castor IV boosters or Minuteman II/III upper stages, Peacekeeper and C-4 boosters.

Propellants

<u>Pre-Fueled Liquid Propellant Missile.</u> The fuel for pre-fueled liquid propellant missiles would be unsymmetrical dimethylhydrazine (UDMH), the oxidizer would be inhibited red fuming nitric acid (IRFNA), and the initiator would be a solid propellant gas generator.

<u>Non-Pre-Fueled Liquid Propellant Missile.</u> The non-pre-fueled liquid propellant missiles may use any of the following propellants

- Fuel - kerosene, coal tar distillate, JP-8, monomethylhydrazine (MMH), hydrazine, and UDMH;
- Oxidizer - nitrogen tetroxide (N_2O_4), hydrogen peroxide[5], and IRFNA; and
- Initiator Fuel - triethylamine, dimethylaniline, and helium.

<u>Solid Propellant Missile.</u> The solid propellant missiles would use: ammonium perchlorate, hydroxyl-terminated polybutadiene, aluminum, or nitroplasticized polyurethane.
Representative weights of the propellants proposed for use in the target missiles are provided in Table 2-1.

Table 2-1. Representative Propellant Weights in Target Missiles in kilograms (pounds)

	Fuel	Oxidizer	Initiator Fuel
Pre-Fueled Liquid Propellant Target	170 (375)	502 (1,106)	20.9 (46)
Non-Pre-Fueled Liquid Propellant Target	825 (1,819)	2,920 (6,437)	30 (66)
Solid Propellant Target	10,101 (22,269)	-	-

5 Hydrogen peroxide can be used as an oxidizer in conjunction with hydrocarbon or alcohol based fuels. Highly concentrated hydrogen peroxide can also be used as a monopropellant although this has not been proposed for any of the missiles being discussed in this document.

2.1.2.2 Interceptor Missiles

Interceptor missiles generally consist of a booster and a kill vehicle. The boosters proposed for launch from the MLP would use solid propellants, which would likely include aluminum and ammonium perchlorate. The kill vehicle would use liquid propellants, such as MMH and N_2O_4. The kill vehicles would arrive at the ordnance loading port fully fueled and would be integrated with the booster while the MLP is at port.

The interceptor missiles proposed to be launched from the MLP, including the PAC-3, would be smaller than the solid propellant targets proposed. Therefore, the impacts of launching the interceptors would be less than the impacts of launching the solid propellant targets. The analysis in this document will focus on the impacts associated with launching the solid propellant targets. Interceptors that would have environmental impacts greater than or different from those analyzed in this analysis would need to be addressed in future documentation, as appropriate.

2.1.3 Missile Test Event Description

During launch, there is a potential for missile malfunction, resulting in explosion, fire, and debris impact in the launch site vicinity. Successful launches involve only small potential hazards, mainly for personnel in the immediate area; these personnel would be protected by the deck of the MLP and potential hazards are therefore controlled. It is also possible for the missile to have an anomaly or be terminated while ready to launch or shortly after launch. Additional precautions would be taken to minimize risk from these scenarios.

The establishment of a Launch Hazard Area (LHA) is required for each test event to provide protection for mission-essential personnel. The LHA provides a designated area from which personnel are cleared based upon potential hazards from any missile debris that may result from launch or near-launch failure. A mission-specific LHA would be established based upon the actual flight profile, launch location, and system performance. Before missile launch, Notices to Airmen (NOTAMs) and Notices to Mariners (NOTMARs) might be required. These notices would identify areas to remain clear of and the times that avoidance of the area is advised. Area clearance requirements and the decision to launch are the responsibility of the appropriate range safety personnel.

After the LHA and launch corridors for the interceptor and target are both verified clear, the launch command would be given from the launch control area. Standard protective procedures would be followed during test activities to provide hearing protection for workers and minimize any noise impacts associated with launch activities. Missile impact zones would be confined to open areas at sea. The standard operating and safety procedures mentioned above would be tailored for specific missions as necessary.

Implementation of these procedures for missile launches and tests would minimize the risk of any adverse health or safety impacts associated with conducting launches from the MLP.

Test mishaps for target and defensive missiles are defined in terms of three scenarios: termination/detonation on the launcher, termination of a flight shortly after liftoff, and termination of a flight after it has exited the vicinity of the launch site.

A test mishap or termination of a flight on the launcher/launch pad would be characterized by an explosion and/or detonation of the missile propellants and explosives, or a scenario in which the missile propellants and explosives burn without detonation or explosion. An Explosive Safety Quantity-Distance (ESQD) surrounding the launcher/launch pad would be calculated based on the equivalent explosive force of the total quantity of propellant and pyrotechnic materials contained in the flight vehicle including the payload.[6]

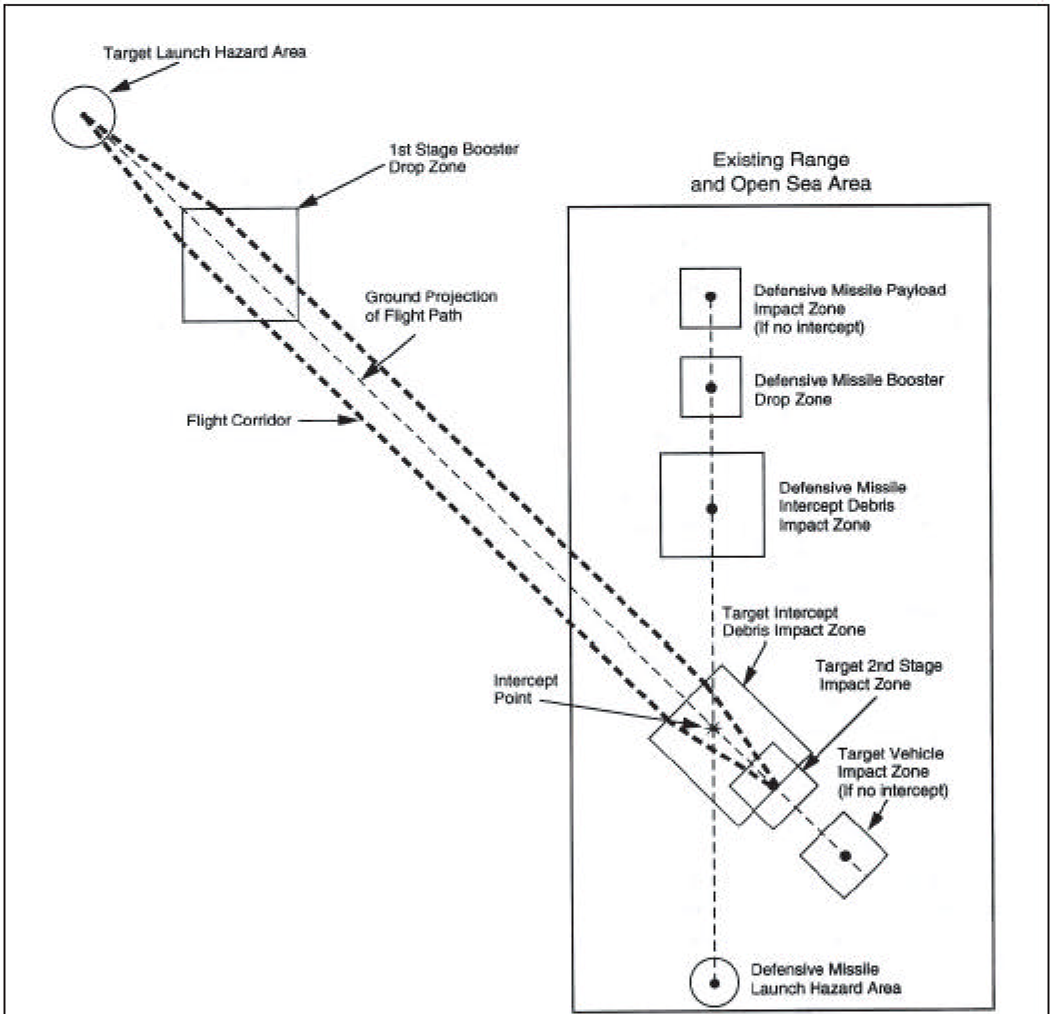
Termination of a flight shortly after liftoff would result in all hazardous debris being contained within the LHA. Mission essential personnel would be located below the deck of the MLP and would be protected from a test mishap or termination on the launcher/launch pad.

Termination of a flight after it has exited the vicinity of the launcher/launch pad would occur in the event of an off-course flight. The FTS would be activated, terminating the missile's thrust, and the vehicle would fall in a ballistic trajectory into the sea. Before each flight, a flight corridor and debris footprint potential would be established such that the probability of human casualties or property damage would be extremely remote in the event of a command destruct event or missile anomaly. This debris footprint takes into account all planned missile body impact points and potential intercept debris patterns. Mission planning and procedures would be developed to activate the FTS in time to ensure that the missile would fall within a defined area in the event of an off-course flight. No efforts are planned at this time to recover a missile from a failed missile intercept that falls into the ocean.

Figure 2-4 depicts typical target and defensive missile LHAs, booster drop zones, intercept debris impact zones, and intact target vehicle and defensive missile impact zones. Impact zones are areas in which hardware impacts would occur. The location and dimensions of the impact zones may vary for each flight test scenario. Impact areas for expended boosters, target vehicles, defensive missile debris resulting from a successful intercept, and intact defensive missile payloads (in the event of a failed intercept) would be determined for each test event based on detailed launch planning and trajectory

[6] Specific missile test events would require compliance with appropriate ESQDs.

Figure 2-4. Representative Impact Zones



Source: Modified from U.S. Army Space and Strategic Defense Command, 1994

modeling. This planning and modeling would include analyses and identification of a flight corridor based on a flight failure at any point in the flight trajectory.

2.1.4 Missile Test Activities

There are three types of activities associated with launching missiles from the MLP, pre-launch, launch, and post-launch activities.

Pre-launch Activities. Pre-launch activities include transporting missiles and propellants to the ordnance loading port, which would be conducted via road, rail, air, or a combination of transport methods. Existing roads, railways, and air routes would be used. All transportation within the U.S. would be performed in accordance with appropriate DOT approved procedures and routing, as well as Occupational Safety and Health Administration (OSHA) requirements and appropriate DoD safety regulations.

Transporting the MLP from the ordnance loading port to the test event location also is a pre-launch activity. Activities associated with transportation of the MLP from the ordnance loading port to the launch location would be the same as for other marine vessel activity in the area.

As part of pre-launch activities the test event sponsor would be responsible for coordinating airspace use. NOTAMs and NOTMARs may be required to notify people in the affected area that missile launch activities are scheduled from the MLP. Area clearance requirements and final launch decision is up to the appropriate range safety personnel. Clearance and closures of the airspace and warning areas are considered normal operations and would be determined using mission specific pre-launch and flight corridor calculations. Radar and visual sweeps of the hazard area would be conducted immediately prior to launch to ensure they are clear of non-critical personnel.

If it were necessary to fuel the missile on the MLP, either while at the ordnance loading port or while at sea, fueling would take place over a period of several days. Although total oxidizer and fuel vapor emissions would vary depending on the propellant transfer equipment used and how it is assembled, it is anticipated that only very small amounts (approximately 10 grams [0.4 ounce]) of oxidizer vapors would be released into the atmosphere during the oxidizer transfer operation. (U.S. Army Space and Missile Defense Command, 2002b) A negligible amount of fuel vapors would also be released into the atmosphere during fuel transfers. Spill prevention, containment and control measures would be developed as appropriate for the ordnance loading ports. Liquid propellants would be transported to the ordnance loading port in DOT-certified transport/storage containers and transferred from these containers into the missile.

All fueling, whether at the ordnance loading port or while at sea, would be conducted using impermeable barriers appropriate for this type of activity. Spill containment for the propellant transfer operation would be provided by a temporary containment system that is impervious to each particular propellant. One set of temporary containment barriers would be used for fuel transfer operations, and a second set would be used for oxidizer transfer operations. The propellant storage locations would be periodically monitored for leaks by visual inspection. After completion of the transfer operations, the transfer equipment would be flushed to decontaminate it.

Should it become necessary to remove the propellant from the booster, the propellant would be transferred into empty bulk liquid propellant containers. The propellant containers would then be transported back to the respective propellant storage areas for reuse in the next mission. The defueled oxidizer tank would be flushed with deionized water and the fuel tank would be flushed with ethyl alcohol. The material generated from flushing the fuel and oxidizer systems would be handled as hazardous waste and would be disposed according to appropriate procedures at the ordnance loading port. The booster would be transported back to the missile assembly building for reuse or returned to an appropriate storage facility.

Other preparation activities including adding fins to the missile and elevating the missile to the appropriate launch angle would be included as part of pre-launch activities.

Launch Activities. Launch activities include the ignition of rocket motors, flight of the missile along the flight path, and deposition of boosters in designated impact areas, if necessary. To launch missiles from the MLP it may be necessary to establish a 3.7-kilometer (two-nautical mile) radius area as a temporary warning area, extending from the surface to 18,290 meters (60,000 feet) mean sea level above the MLP. Because of the mobile nature of missiles, only a small portion of the launch exhaust and launch-related noise would occur near the test event location.

Impact zones for each test event would be delineated based on detailed launch planning and trajectory modeling. This modeling would include analysis and identification of a flight corridor. Launches would be conducted when trajectory modeling verifies that flight vehicles and debris would be contained within predetermined areas, all of which would be located over the open ocean and removed from land and populated areas.

As a result of successful intercepts, there would be debris comprised of both the target and the interceptor missile. The resulting debris follows a ballistic trajectory and would impact in the open ocean. Because an exact point of termination cannot be determined, the impact footprint is determined by considering the limits of debris fallout based on destruction of a test missile at the boundaries of the acceptable flight corridor, along with additional flight time outside the acceptable flight corridor based on the time required to initiate the FTS.

Post-launch Activities. Post-launch activities would involve a visual inspection of the deck area and collection of any debris on the deck. The fuel burned during the buildup of thrust and lift-off could scorch coatings and insulation materials on the MLP and leave carbon residues on the deck. Debris including any water produced from cleaning the deck would be disposed of in accordance with applicable regulations including the International Convention for the Prevention of Pollution or brought back to port for disposal.

The MLP would be transported from the test event location to the ordnance loading port or home port as appropriate. In instances where the missile veers off-course it may be necessary to use an FTS. If an in-flight malfunction occurs, the Range Safety officer may initiate flight termination, resulting in missile debris being deposited along the flight path.

2.1.5 Sensor Description

Types of sensors that would be used on the MLP could include radars, telemetry, and optical systems. The sensors would acquire, collect, record, and process data on targets and interceptors during testing. The sensors would collect the data from a test support position not available to land-based sensors. The MLP would provide the capability to locate selected sensors at test support positions in remote areas of the ocean.

2.1.5.1 Radar

Several radar systems, current and projected, are candidates for use on the MLP. The TPS-X, Mk-74, and COSIP radars are existing radars that are already in use. These radars are considered representative of those that may be used on the MLP. Radars employed on the MLP would use software or mechanical means to stabilize illumination angles.

Radar test locations would be selected and radar operation would be controlled to ensure that hazards associated with electromagnetic radiation (EMR) would be minimized. Personnel hazard exclusion areas would be established such that EMR levels outside these zones would not exceed human safety exposure limit thresholds. Test locations for the MLP would be selected such that the thresholds for human exposure would not be exceeded.

TPS-X. The TPS-X radar is a transportable wide band, X-band, single faced, phased array radar system of modular design (see Figure 2-5). The radar consists of five individual units: Antenna Equipment Unit, Electronic Equipment Unit, Cooling Equipment Unit, Operator Control Unit, and power unit. The Antenna Equipment Unit includes all transmitter and beam steering components as well as power distribution and cooling systems. The Electronic Equipment Unit houses the signal and data processing equipment, operator workstations, and communications equipment. The Cooling Equipment Unit contains the fluid-to-air heat exchangers and pumping system to cool the antenna array and power supplies. The power unit would use a self-contained trailer with a noise-dampening shroud that contains a diesel generator, governor and associated controls, a diesel fuel tank, and air-cooled radiators. The Antenna Equipment Unit, Electronic Equipment Unit, Cooling Equipment Unit, and power unit are housed on separate trailers interconnected with power and signal cabling, as required.

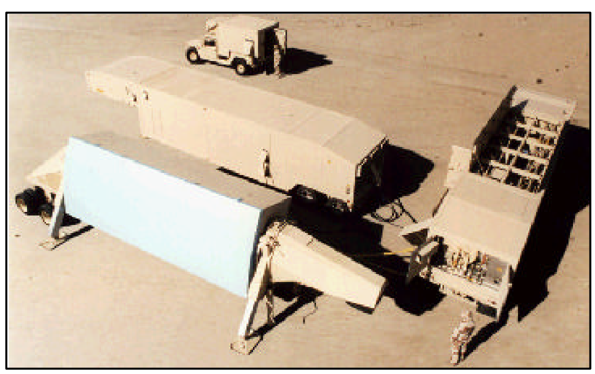


Figure 2-5. TPS-X Radar

Power would be provided by the power unit, in addition to the two 750-kilowatt generators installed on the MLP for ship system operations. Power is needed approximately 12 hours per day, five days per week except during test events when 24 hours per day operations for several days may be required.

The radar would operate at full power for approximately four hours per week for calibration purposes when not supporting a test event. When supporting a test event, the radar would operate at full power for approximately 20 hours per week. A keep out zone would be established in front of the antenna out to 100 meters (328 feet). A personnel hazard exclusion area would be established in front of the radar, out to a distance of 150 meters (492 feet). The Federal Aviation Administration (FAA) would be requested to establish a navigation warning advising aircraft to remain at least 1,500 meters (4,900 feet) from the TPS-X. For any test event, if the TPS-X is aimed at four degrees above the shore from a site approximately 7.5 kilometers (4.7 miles) away, the TPS-X would radiate at a minimum of approximately 949 meters (3,112 feet) above beach-level. The X-band extends from 10.25 to 10.50 gigahertz. The maximum radiofrequency values in the main radar beam at this distance would be approximately 72 volts per meter, which is approximately half of the uncontrolled exposure limit for humans (158 volts per meter).

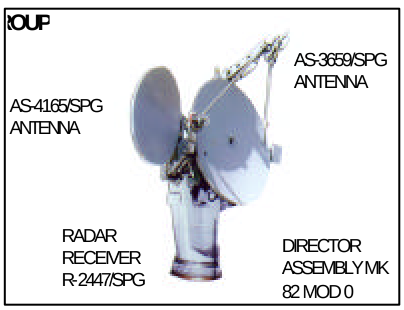


Figure 2-6. MK-74 Radar

Mk-74. Another radar that may be used on the MLP is the Mk-74 radar (see Figure 2-6). This C-band and X-band tracking radar would be deployed on the MLP with additional sensors as it requires pointing data to acquire targets at long range. The Mk-74 was formerly a weapon system illuminator for the Standard Missile-2 in the anti-air warfare role. The system may be used to support BMDS testing. The X-band continuous wave radiates with a power of 5 kilowatts. The C-band (5.450-5.825 gigahertz) radiates with a peak power of 165 kilowatts and an average power of 5 kilowatts. There are numerous support equipment items including an operator console, heating venting and air conditioning, cooling water, and electrical power conditioning that would be installed on or provided by the MLP when the radar is aboard the ship. The Mk-74 support equipment would be powered by the two 750-kilowatt generators on the MLP.

The Mk-74 would be used in conjunction with and pointed by radar such as the TPS-X. The Mk-74 would be given a vector to track a target by radar, such as the TPS-X. It would use elevations and operation times similar to the TPS-X; however, the peak power of the Mk-74 is considerably lower than the TPS-X.

COSIP. The COSIP is C-Band radar that would be used in conjunction with SHOTS. The radar can image distant targets with extreme accuracy and is capable of emitting 3.7 megawatts of power (PMRF, 2002). The COSIP would be used on the MLP for imaging target intercepts. The COSIP radar would be powered by the two 750-kilowatt generators on the MLP.

2.1.5.2 Telemetry

TTS. Telemetry equipment such as the TTS would be placed on the MLP to collect data about the flight of missiles launched during test events. Using the MLP for these tests would allow the telemetry equipment to be placed in locations that were previously not accessible using only land-based equipment. The TTS would provide long-range missile telemetry acquisition, processing, and archiving capability in a transportable redundant configuration. The system configuration would consist of two trailers (10 by 2 meters [33 by 8 feet]) sharing a common wall, which would house all system equipment except for two seven-meter (23-foot) motion stabilized antennas and power shelter. The TTS would be powered by dual 10-kilowatt generators.

The TTS would be capable of receiving and archiving multiple encrypted telemetry streams. The TTS antenna systems would cover the Upper and Lower L-Band and S-Band telemetry frequencies. The primary use of the TTS would be to provide extended telemetry coverage and voice/data communications beyond the current capabilities. Alternatively, the TTS may be used to augment existing range assets either independently or in conjunction with a Range Safety system to support test infrastructure stressing BMDS tests at a specific location.

Mobile Range Safety Systems (MRSS). The MLP could also be used as a platform for mobile range safety systems. Figure 2-7 shows some of the equipment that would be typical of these types of systems. The mobile range safety systems would provide extended over the horizon capability as a stand-alone telemetry system or as a mobile FTS. The systems would consist of two transmitters, two telemetry antennas, two Global Positioning System antennas mounted on poles less than 12 meters (40 feet) high, a Military Tactical Shelter, a Very Small Aperture Terminal (VSAT) Shelter with a satellite terminal, and a 50-kilowatt generator. The communications subsystem includes; VSAT capable of real time data transmission, two Inmarsat Systems for redundant voice and data transmissions and High Frequency, Very High Frequency, and Ultra High Frequency transceivers. The system would also have its own power generation system, interface to existing power sources,

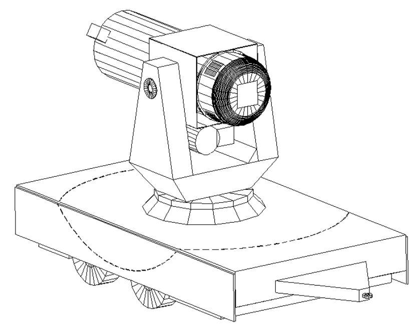
Figure 2-7. MRSS Equipment

automatic power transfer switching and uninterruptible power system power for the sub systems. The mobile range safety systems would occupy a footprint of approximately 280 square meters (3,000 square feet).

2.1.5.3 Optical Systems

Mobile optical systems, such as SHOTS (see Figure 2-8), would be temporarily mounted on the MLP. As with radar and telemetry systems, the MLP would provide test support positions in remote ocean areas previously inaccessible to sensors such as SHOTS. Other optical systems include the mobile Innovative Science and Technology Experimentation Facility (ISTEF) mounts. The 750-kilowatt generators on the MLP would power these passive systems. Some systems may require pointing data but each test event sponsor would determine those requirements as needed. Pointing data would be obtained through acquisition radar or other external cueing.

Figure 2-8. SHOTS



It is a mobile optical unit with high resolution, high frame-rate, visible and infrared (mid-wave or long wave) camera and long focal length telescope. Its secondary imaging system has a wide field of view and visible and mid-wavelength infrared (MWIR) imaging system cameras for coarse acquisition.

2.1.6 Sensor Test Event Description

A test event could include the use of a sensor on the MLP to observe a missile flight or intercept, and to provide missile-tracking support. Telemetry equipment may be used in conjunction with and pointed by radars. This would give the telemetry a vector to track a target. Optical systems may require pointing data through acquisition radar or other external cueing. Sensors onboard the MLP would radiate at the home port and while in transit to calibrate the equipment. For any test event the sensors would be aimed at least five degrees above the horizon to avoid impacts to people on the shore.

A personnel exclusion area would be established to protect personnel from potential EMR hazards. Personnel not involved in test event activities would not be permitted to enter established hazard zones while the sensor is in operation. EMR hazard zones would be established within the beam's tracking space and near emitter equipment. A visual survey of the area would be conducted to verify that all personnel are outside of the hazard zone prior to startup. NOTAMs and NOTMARs might be required before sensor operational activities and non-participating personnel would be restricted from the test area. The actual sensor operation area at the test event location would be restricted in order to minimize impacts to aircraft operations, electroexplosive devices (EEDs), and communication equipment.

2.1.7 Sensor Test Activities

There are three types of activities associated with using sensors onboard the MLP. These activities include pre-operational, operational, and post-operational activities.

Pre-operational. Pre-operational activities include transporting the sensor to the home port, loading the sensor equipment, and transporting the sensor from the home port to the test event location. Other preparation activities, including set-up and maintenance of sensor systems, which are currently conducted at the home port would be included as part of pre-operational activities. Sensor equipment may be flown by C-130 aircraft to Travis AFB, located approximately 48 kilometers (30 miles) from Mare Island. The sensor equipment would then be transported by truck over public roads from Travis AFB to the home port. Existing roads and air routes would be used. All transportation within the U.S. would be performed in accordance with appropriate DOT approved procedures and routing, as well as OSHA requirements and appropriate DoD safety regulations.

Sensors would be placed on an existing platform on the MLP and result in no new construction. A stabilized mount would minimize the effects of wave motion in the open ocean. The sensor system would be supplied with all necessary tie down equipment needed to firmly mount the trailers on the MLP.

Activities associated with transportation of the MLP from the home port to the launch location would be minimal and would be the same as for other marine vessel activity in the area.

Test event sponsors would be responsible for coordinating airspace use. This may include issuing NOTAMs and NOTMARs to notify people in the affected area that a test event is planned. It may be necessary to use aircraft to ensure that the test area is clear of non-participating aircraft and marine vessels.

Operational Activities. During transport of the MLP it may be necessary to conduct in-transit use of the sensors for calibration purposes. Sensors on the MLP may require the use of generators to support the power requirements of the sensor system. In some instances the two 750-kilowatt generators on the MLP may be sufficient to power necessary on-board systems and the sensor but in other cases it would be necessary to use supplemental generators to power the sensor.

Operational activities also include the use of the sensor to support the test event.

Post-operational. Post operational activities for sensors would include general maintenance and ensuring that the equipment is secure for moving the MLP from the test event location to the home port. Sensors would not be tested or calibrated while moving the MLP from the test event location to the home port, therefore any supplemental generators added to the MLP to power the sensor equipment would not operate during transit. Once at the home port, the sensor and any associated equipment would be unloaded.

2.2 Test Event Locations

This EA considers the environmental impacts associated with testing activities in various locations in the Pacific Ocean.

2.2.1 Western Range (Point Mugu Sea Range), California

The Western Range includes a broad area of the Pacific Ocean that extends westward from the coast of southern California. For purposes of this EA, the Western Range would include the Point Mugu Sea Range. Therefore, launches using the MLP could occur from a launch point in the Western Range or the Point Mugu Sea Range. The range functions as the test area for space and missile operations. Only that portion of the range affected by a test activity is usually activated during operations. Activation of the affected range area consists of instructing ships and airplanes not to enter the area by issuance of a NOTMAR and a NOTAM, respectively, and either sheltering or evacuating people in the activated area. The Western Range would be responsible for determining sheltering needs for people in the affected area.

The use of sea-launched missiles for test events in the Western Range was considered in the U.S. Army Space and Strategic Defense Command *Theater Missile Defense Extended Test Range Final EIS* (November 1994) and the U.S. Navy *Point Mugu Sea Range EIS/Overseas EIS* (March 2002).

2.2.2 Pacific Missile Range Facility, Kauai, Hawaii

PMRF is located in Hawaii on the western shore of the island of Kauai, and includes broad ocean areas to the north, south, and west. PMRF is a U.S. Navy installation used for fleet training operations and for research and development activities. In addition, PMRF launch facilities are used to launch test flights of tactical missiles and other projectiles.

PMRF is capable of supporting subsurface, surface, air, and space operations. The PMRF range area consists of 144,000 square kilometers (55,599 square miles) of controlled airspace. PMRF is the standard reference for the land-based installations on Kauai, the underwater ranges, and their assets unless referring to a specific site or facility complex. PMRF on Kauai includes the main base complex (PMRF/Main Base), Makaha Ridge, Kokee, Kamokala Magazines, and the U.S. Navy activities at Port Allen.

The use of a mobile sea-based platform to launch missiles was addressed in the U.S. Navy *Pacific Missile Range Facility Enhanced Capability EIS* (December 1998) and U.S.

Army Space and Missile Defense Command *THAAD Pacific Test Flights EA* (December 2002).

2.2.3 Republic of the Marshall Islands USAKA/RTS

USAKA/RTS is comprised of USAKA test facilities, Wake Island test facilities, the open sea area between the two facilities, and the open sea area south of USAKA. USAKA is located in the Republic of the Marshall Islands approximately 1,126 kilometers (700 miles) south of Wake Island and approximately 3,379 kilometers (2,100 miles) southwest of Hawaii. Wake Island is located approximately 3,219 kilometers (2,000 miles) west of Hawaii.

Kwajalein is the world's largest coral atoll surrounding the world's largest lagoon; the surface area of the lagoon is 1,711 square kilometers (661square miles). Eleven of the 100 islands comprising the Atoll are leased by the U.S. from the Republic of the Marshall Islands government. The total land area of the atoll is 9 square kilometers (3.5 square miles).

Wake Island is a possession of the U.S. administered from Anderson AFB in Guam since October 1, 2002. It is a small V-shaped coral atoll consisting of three islands, Wake, Peale and Wilkes.

The open sea areas north and southwest of USAKA are possible sites for locating the MLP during test events. Missile launch tests would be conducted from the sea launch location toward USAKA or Wake Island.

The use of sea-launched missiles for testing events in USAKA/RTS was considered in the U.S. Army Space and Strategic Defense Command *Theater Missile Defense Extended Test Range Final EIS* (November 1994) and U.S. Army Space and Strategic Defense Command *Supplemental EIS, Proposed Actions at U.S. Army Kwajalein Atoll*, (December 1993).

2.2.4 Broad Ocean Area

The BOA would include a large portion of the Pacific Ocean. For any one specific test the defined test area would be limited and would be clearly defined. Much of the proposed test area is characterized as deep, open portions of the ocean.

2.3 Specific Test Events

Six specific tests using the MLP have been identified by the MDA and are in various stages of planning. Other proposed future tests that have impacts that are within the parameters of those discussed in this EA may rely on the analysis in this document, as appropriate.

Arrow System Improvement Program test from the Western Range (Point Mugu Sea Range (2004). To support the test of the Arrow Weapons System, a non-pre-fueled liquid propellant target missile would be launched from the MLP and an interceptor would be launched from San Nicolas Island on the Point Mugu Sea Range. A Finding of No Significant Impact was signed on November 26, 2003 finalizing the EA that analyzed the Arrow System Improvement Program.

Integrated Flight Test (IFT) (2004). The IFT would use the MLP as a radar and telemetry platform. The MLP would be placed in a remote area of the Pacific Ocean where land-based assets could not provide coverage. These sensors would collect data on flight tests that occur as part of the IFT.

Critical Measurements Program test from PMRF (2004). The Critical Measurements test would include launching targets from the MLP along a southern trajectory from a launch point north of PMRF. This test would not include an intercept attempt.

PAC-3 weapons system test from the Western Range (2005). The PAC-3 test using the MLP would consist of target missiles launched from Vandenberg AFB and interceptor missiles launched from the MLP positioned in the Western Range.

THAAD weapons system from PMRF (2005). The THAAD test would include launching a target from the MLP from a launch point in the PMRF range area. This test would include an intercept by THAAD, launched from PMRF. Use of the MLP for THAAD launches from PMRF was previously analyzed in the U.S. Army Space and Missile Defense Command *THAAD Pacific Flight Tests EA* (December 2002).

Telemetry system tests from the BOA (2005). Two telemetry system tests for the TTS are being considered for mid and late 2005 to collect missile data from the MLP from a point in the BOA.

2.4 Home Port

Mare Island is located approximately 40 kilometers (25 miles) northeast of San Francisco in Vallejo, California. In 1854 the Mare Island Naval Shipyard started building and performing maintenance on U.S. Navy vessels. For over 100 years, the base had been used for the construction, repair and maintenance of ships and nuclear submarines. A variety of activities at the base caused contamination with low levels of hazardous waste, including battery acids, polychlorinated biphenyls, lead, mercury, asbestos, and radioactive materials.

In 1993, the facility was proposed for Base Realignment and Closure (BRAC). A cleanup team was established which included the U.S. Navy's radiological control office and a radiation survey was conducted of the entire base. Over 100,000 samples were analyzed and 30 sites were identified as requiring cleanup. Solid and liquid waste was transported to the appropriate local companies for treatment. The City of Vallejo established a reuse plan for Mare Island after its closure in 1993. An *EIS/Environmental Impact Report for the Disposal and Reuse of Mare Island Naval Shipyard, Vallejo, California* (April 1998) analyzed the impacts of the disposal and reuse of the Naval Shipyard. In October 1998, the U.S. Navy issued a Record of Decision for the reuse of Mare Island. The Record of Decision announced the U.S. Navy's decision to dispose of property associated with Mare Island in a manner consistent with the City of Vallejo's reuse plan. There are no changes required to Mare Island to support docking, servicing, or maintaining the MLP.

2.5 Ordnance Loading Ports

The MLP, when used for missile launches, would not load ordnance at Mare Island due to safety restrictions. A limited number of ports are equipped and authorized to handle ordnance. The ports currently being considered for use are Concord Army Terminal, Port of Oakland/U.S. Navy Fleet and Industrial Supply Center, U.S. Naval Weapons Station Seal Beach, and U.S. Naval Station Pearl Harbor. The missile provider would arrange for shipment of the missile to the appropriate port. The MLP program would arrange for the ship to arrive at the appropriate time. The missile would be inspected prior to loading on the ship. Once satisfied the missile is not damaged and is ready for loading, the containers would be lifted onto the ship using certified cranes. Depending upon the particular ordnance, U.S. Coast Guard and/or other security personnel would escort the ship at least until it departs the port. Some missile systems/ordnance might require armed guards throughout deployment.

2.6 Alternatives to the Proposed Action

Two alternatives to the proposed action have been identified and will be considered in this EA. These alternatives include

- **Alternative 1 -** using the MLP for the launch of all missile types (pre-fueled and non pre-fueled liquid propellant target missiles, solid propellant target missiles, and solid propellant interceptor missiles) but not for testing sensors.

- **Alternative 2 -** using the MLP to test sensors and launch pre-fueled liquid propellant missiles and solid propellant missiles but not non-pre-fueled liquid propellant missiles.

2.7 No Action Alternative

Under the no action alternative, existing activities to be conducted from the MLP would continue and additional activities using the MLP would be considered on a case-by-case basis. Sensor testing and missile launches would continue from existing locations and facilities but the MDA would not have the flexibility of using the MLP as a platform to conduct testing of sensors or launches of missiles from the MLP. The potential benefits to the testing program from implementing realistic flight-test scenarios and the greater flexibility afforded with a mobile platform would not be realized.

2.8 Alternatives Considered but Not Carried Forward

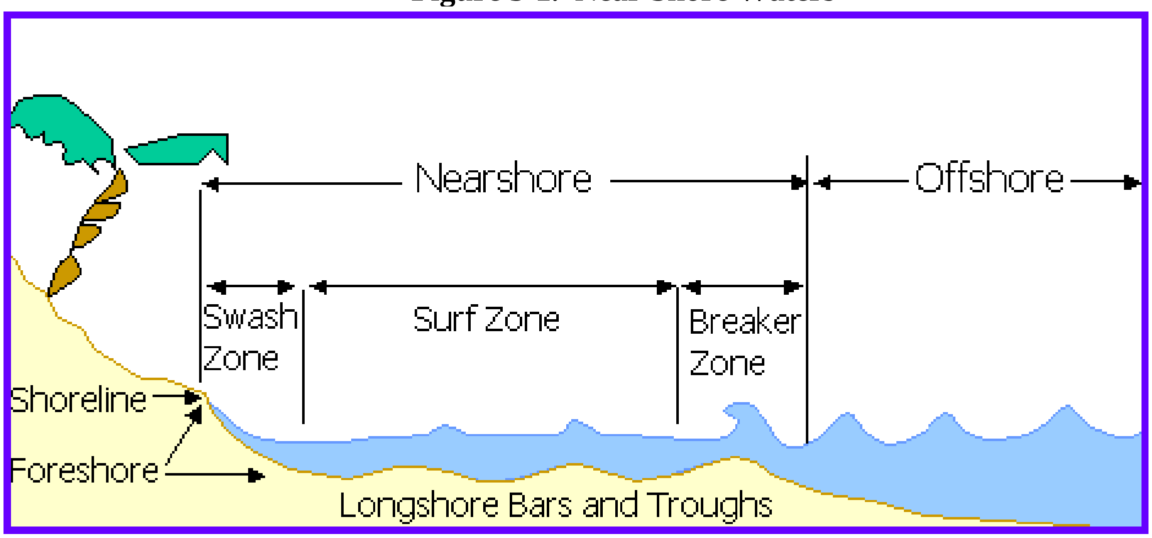
The use of Concord Army Terminal, California as a home port location was considered as an alternative to using Mare Island but was eliminated from further consideration due to the financial infeasibility of docking the MLP at this location. Mare Island has an established lease in place for docking the MLP and there is already an established relationship with local authorities. Mare Island is located in close proximity to the ordnance loading locations at Concord Army Terminal. Mare Island is also located near Suisun Bay, which is a potential source of spare parts for the MLP.

3. *AFFECTED ENVIRONMENT*

3.1 Region of Influence

The Region of Influence (ROI) is a geographic area in which environmental effects would be most likely to occur. Because most test events using the MLP would take place at sites in the open Pacific Ocean, specific resource area impacts, such as those related to specific watersheds or air quality regions, would not apply to the analysis. For this EA, the ROI for all resource areas was conservatively defined to include the open ocean areas around the MLP. The specific size of the ROI would vary based on the type of test event scheduled to occur from the MLP. Because it may also be possible to use the MLP to conduct test events in near shore waters, the ROI would include the nearest onshore area if near shore locations were chosen. The near shore is an indefinite zone extending seaward from the shoreline beyond the breaker zone (see Figure 3-1). This typically includes water depths less than 20 meters (65 feet). (Discover the Outdoors, 2002)

Figure 3-1. Near Shore Waters



Source: Texas A&M University, Division of Nearshore Research, 2003

3.2 Definition of Resource

3.2.1 Air Quality

Air quality in a given location is described by the concentrations of various pollutants in the atmosphere, expressed in units of parts per million or milligrams per cubic meter. The type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the meteorological conditions related to the prevailing climate determine pollutant concentrations. The significance of a pollutant concentration is determined by comparison with Federal, state, and local ambient air quality standards. These standards establish limits on the maximum allowable concentrations of various pollutants to protect public health and welfare.

The existing air quality of the affected environment is defined by examining air quality monitoring records from monitoring stations maintained by the appropriate state or local agency. Information on pollutant concentrations measured for short-term (24 hours or less) and long-term (annual) averaging periods is extracted from monitoring data to characterize the existing ambient air quality of the area.

Emissions from sea launches in the Pacific Ocean fall under Section 328 of the Clean Air Act (CAA) (42 United States Code [USC] 7627) and are regulated by the resulting U.S. Environmental Protection Agency (EPA) regulations, Outer Continental Shelf Air Regulations (40 CFR 55). Under 40 CFR 55, sea vessels are not considered Outer Continental Shelf emission sources because they are not permanently attached to the seabed. However, while in U.S. waters, activities by sea vessels are covered by any applicable portions of the CAA, such as Title VI, Stratospheric Ozone Protection.

3.2.2 Airspace

Airspace refers to that space which lies above a nation and comes under its jurisdiction. Airspace is a finite resource that can be defined vertically and horizontally, as well as temporally, when describing its use for aviation purposes. Time is an important factor in airspace management and air traffic control.

Airspace management and use are governed by the regulations set forth by the FAA in Public Law 85-725, Federal Aviation Act of 1958. The types of airspace are defined by

- Complexity or density of aircraft movements,
- Nature of operations conducted within the airspace,
- Level of safety required, and
- National and public interest in the airspace.

The categories of airspace are controlled, uncontrolled, special use, and other airspace. Definitions of airspace categories are provided in Table 3-1.

Table 3-1. Definitions of Airspace Categories

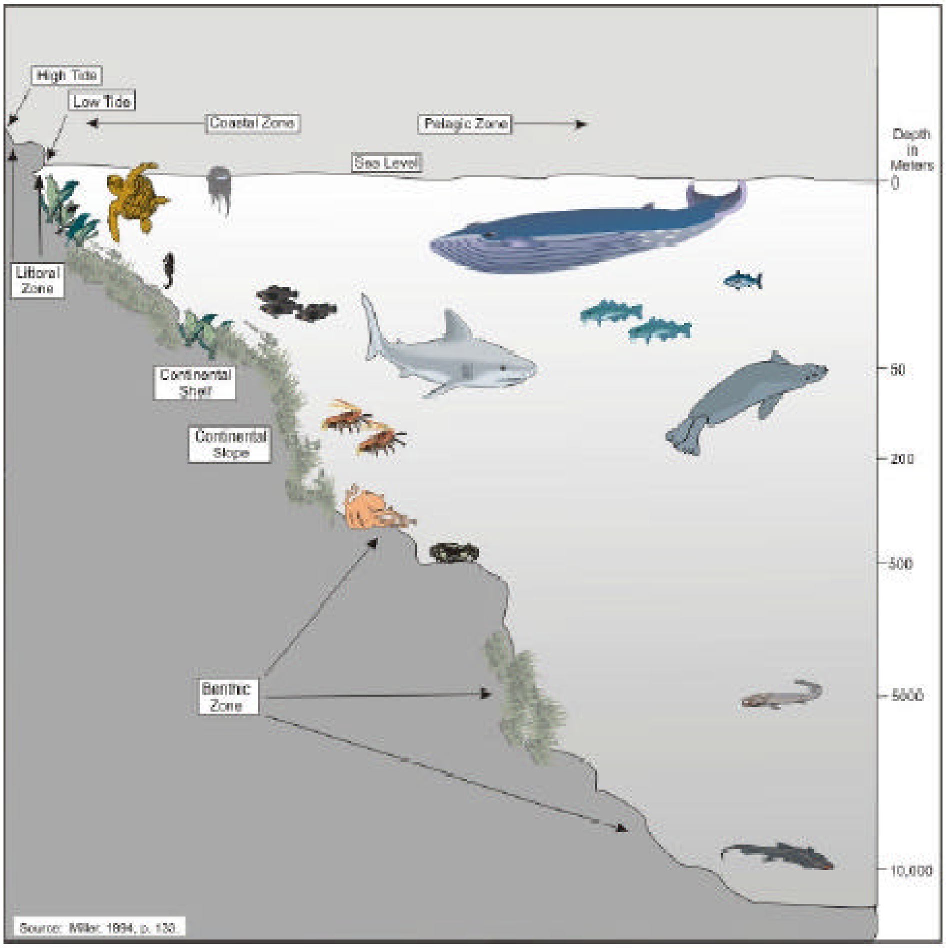
Category	Definition	Examples
Controlled Airspace	Airspace used by aircraft operating under Instrument Flight Rules (IFR) that require different levels of air traffic service	▪ Altitudes above Flight Level (FL) 180 (5,500 meters [18,000 feet] above mean sea level [MSL]) ▪ Airport Traffic Areas ▪ Airport Terminal Control Area ▪ Jet Routes ▪ Victor Routes
Uncontrolled Airspace	Airspace primarily used by general aviation aircraft operating under Visual Flight Rules (VFR)	▪ As high as 4,420 meters (14,500 feet) above MSL
Special Use Airspace	Airspace within which specific activities must be confined or access limitations are placed on non-participating aircraft	▪ Restricted Areas ▪ Military Operations Areas
Other Airspace	Airspace not included under controlled, uncontrolled, or special use categories	▪ Military Training Routes

3.2.3 Biological Resources

Native or naturalized vegetation, wildlife, and the habitats in which they occur are collectively referred to as biological resources. Biological resources include threatened and endangered species and environmentally sensitive habitats.

Marine life ranges from microscopic one-celled organisms to the world's largest mammal, the Blue whale. Marine plants and plant-like organisms can live only in the sunlit surface waters of the ocean, often referred to as the photic zone, which extends approximately 101 meters (330 feet) below the surface. Beyond the photic zone, the sunlight is insufficient to support plants and plant-like organisms. Animals, however, live throughout the ocean from the surface to the greatest depths. Classification of the Pacific Ocean zones is based upon depth and proximity to land. There are four major divisions, or zones, in the ocean: the littoral zone, the coastal zone, the offshore zone, and the pelagic zone. Spanning all zones is the benthic environment, or sea floor. The coastal zone typically extends from the high tide mark on the land to the gently sloping, relatively shallow edge of the continental shelf, the submerged part of the continents. Figure 3-2 shows the various ocean zones and types of biological species likely to be found in each. (U.S. Air Force Space and Missile Systems Center, *Development and Demonstration of the Long Range Air Launch Target System EA*, October 2002)

Figure 3-2. Ocean Zones



Several Federal agencies oversee various aspects of biological resources management. Two key regulations that govern the protection of biological resources are described below.

The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires all Federal departments and agencies to seek to conserve endangered and threatened species. The Secretary of the Interior must create lists of endangered and threatened species. The term ‘endangered species’ means any species that is in danger of extinction throughout all or a significant portion of its range. The Act defines a threatened species as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The Marine Mammal Protection Act of 1972, as amended (16 USC 1361 et seq.), gives the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries (formerly the National Marine Fisheries Service) co-authority to protect the resource and outlines prohibitions for the taking of marine mammals. A take would result from an attempt to harass, hunt, capture, or kill any marine mammal. Subject to certain exceptions, the Act establishes a moratorium on the taking and importation of marine mammals. Exceptions to the taking prohibition allow USFWS and NOAA Fisheries to authorize the incidental taking of small numbers of marine mammals in certain instances.

3.2.4 Cultural and Historic Resources

Cultural resources include prehistoric and historic artifacts, archaeological sites (including underwater sites), historic buildings and structures, and traditional resources (such as Native American and Native Hawaiian religious sites). Paleontological resources are fossil remains of prehistoric plant and animal species and may include bones, shells, leaves, and pollen. Cultural resources of particular concern include properties listed or eligible for inclusion in the National Register of Historic Places (National Register). Only those cultural resources determined to be potentially significant under 36 CFR 60.4 are subject to protection from adverse impacts resulting from a project. To be considered significant, cultural resources must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register. The term 'eligible for inclusion in the National Register' includes all properties that meet the National Register listing criteria which are specified in Department of Interior regulations at 36 CFR 60.4. Therefore, sites not yet evaluated may be considered potentially eligible for inclusion in the National Register and, as such, are afforded the same regulatory consideration as nominated properties. Whether prehistoric, historic, or traditional, significant cultural resources are referred to as historic properties.

Numerous laws and regulations require that possible effects on cultural resources be considered during the planning and execution of Federal undertakings. These laws and regulations stipulate a process of compliance, define the responsibilities of the Federal agency proposing the action, and prescribe the relationship among other involved agencies (e.g., State Historic Preservation Officer, Advisory Council on Historic Preservation). In addition to NEPA, the primary laws that pertain to the treatment of cultural resources are the National Historic Preservation Act (16 USC 470 et seq.), especially Sections 106 and 110, the Archaeological Resources Protection Act of 1979 (16 USC 470aa-470mm), the Antiquities Act of 1906 (16 USC 431), and the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq.).

3.2.5 Geology and Soils

Geology and soils are those earth resources that may be described in terms of landforms, geology, and soil conditions. The makeup of geology and soils could influence erosion, depletion of mineral or energy resources, seismic risk or landslide, and soil and ground water contamination resulting from proposed construction and operational activities. Geologic conditions also influence the potential for naturally occurring or human-induced hazards, which could pose risk to life or property. Such hazards could include phenomena such as landslides, flooding, ground subsidence, volcanic activity, faulting, earthquakes, and tsunamis. The potential for geologic hazards also is described relative to each environment type's geologic setting.

3.2.6 Hazardous Materials and Hazardous Waste Management

The terms 'hazardous material' and 'hazardous waste' are encompassed within the definition of "hazardous substances" as defined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC Section 9601 et seq., as amended. In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to the public health, welfare, or the environment when released. Hazardous waste is further defined in 40 CFR 261.3 as any solid waste that possesses any of the hazardous characteristics of extraction procedure toxicity, ignitability, corrosivity, or reactivity, or is listed as a hazardous waste in Subpart D of 40 CFR Part 261. Transportation of hazardous materials is regulated by the U.S. DOT regulations as described in 49 CFR.

3.2.7 Health and Safety

Health and safety include consideration of any activities, occurrences, or operations that have the potential to affect the wellbeing, safety, or health of workers or members of the general public. Safety and health risks to workers would occur primarily from accidents during construction, testing, operation, decommissioning, or maintenance activities. However, explosions, fires, and spills of propellants could also endanger workers. Generally, the impact would be limited to workers within the vicinity of the accident. For hazardous operations including launches, project-related personnel would be located below the deck of the MLP, which is hardened to protect them from a launch failure.

3.2.8 Land Use

Land use is described as the human use of land resources for various purposes, including economic production, natural resources protection, or institutional uses. Land uses are frequently regulated by management plans, policies, ordinances, and regulations that determine the types of uses that are permissible or protect specially designated or environmentally sensitive uses. Potential issues typically stem from encroachment of one land use or activity on another or an incompatibility between adjacent land uses that leads to encroachment. Prime agricultural farmlands also fall under this resource category.

All Federal development projects in a coastal zone and all Federal activities that could directly affect a coastal zone must be reviewed to determine their consistency with local Coastal Zone Management Plans.

3.2.9 Noise

Noise is often defined as unwanted or annoying sound that is typically associated with human activity. Most sound is not a single frequency, but rather a mixture of frequencies, with each frequency differing in sound level. The intensities of each frequency combine to generate sound, which is usually measured and expressed in decibels (dB). Decibels are measured on a logarithmic scale. The loudest sound that can be tolerated by the human ear is about 120 dB. The level of normal conversation is about 50 to 60 dB.

Environmental noise associated with industrial and transportation activities is most commonly measured on a scale designated as A-weighted (dBA), which de-emphasizes low and extremely high frequency sounds to which the human ear is less sensitive and has been shown to correlate well with the perceived relative intensity (i.e., loudness) of sound. A change of 10 dBA in a measured sound level represents a tenfold increase in sound energy; such a change is generally perceived by humans as representing only a doubling in loudness. Examples of A-weighted noise levels for various common noise sources are shown in Table 3-2.

To describe the time-varying character of environmental noise, sound levels are frequently characterized in terms of the equivalent noise level (L_{eq}), which is the energy mean A-weighted sound level during a stated measurement period. An additional measurement technique frequently used in noise studies is the Day-Night Average Noise Level (L_{dn}), which accounts for the increased annoyance associated with nighttime noise events.

OSHA regulation 29 CFR 1910.95 establishes a maximum noise level of 90 dBA for a continuous eight-hour exposure during a workday and higher sound levels for a shorter time of exposure in the workplace. When information indicates that an employee’s exposure may equal or exceed an eight-hour time-weighted average of 85 dB, the employer shall develop and implement a monitoring program.

Table 3-2. Comparative A-Weighted Sound Levels

Noise Level (dBA)	Common Noise Levels	
	Indoor	**Outdoor**
100 - 110	Rock band inside New York subway	Jet flyover at 304 meters (997 feet)
90 - 100	Food blender at one meter (three feet)	Gas lawnmower at one meter (three feet)
80 - 90	Garbage disposal at one meter (three feet)	Diesel truck at 15 meters (49 feet) Noisy urban daytime
70 - 80	Shouting at one meter (three feet) Vacuum cleaner at three meters (10 feet)	Gas lawnmower at 30 meters (98 feet)
60 - 70	Normal speech at one meter (three feet)	Commercial area heavy traffic at 100 meters (328 feet)
50 - 60	Large business office Dishwasher next room	
40 - 50	Small theater (background) Large conference room (background)	Quiet urban nighttime
30 - 40	Library (background)	Quiet suburban nighttime
20 - 30	Bedroom at night	Quiet rural nighttime
10 - 20	Broadcast and recording studio (background)	
0 - 10	Threshold of hearing	

Source: U.S. Department of Transportation, 2002

3.2.10 Socioeconomics and Environmental Justice

Socioeconomics is defined as the basic attributes and resources associated with the human environment, in particular population and economic activity. Socioeconomic resources consist of population, employment, and income. Other socioeconomic aspects that are often described may include housing and an overview of the local economy.

Environmental justice (E.O. 12898) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies. Meaningful involvement means that potentially affected residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; the public's contribution can influence the agency's decision; the concerns of all participants involved will be considered in the decision making process; and the decision makers seek out and facilitate the involvement of those potentially affected.

3.2.11 Transportation and Infrastructure

Transportation and traffic circulation refer to the movement of vehicles (automobiles, ships, and trains) from origins to destinations. Roadway operating conditions, or the adequacy of the existing and future roadway system to accommodate these vehicular movements, are usually described in terms of the volume-to-capacity (V/C) ratio, which is a comparison of the average daily traffic volume on the roadway to the roadway capacity.

Infrastructure includes facilities and systems that provide power; water; wastewater and sewage treatment; waste collection and disposal; and fire, health, emergency and police services to affected installations and local communities.

Sewage is most often removed from ship holding tanks by either ship-to-shore or ship-to-ship transport methods. These transport methods are accomplished using flexible rubber or plastic sewage transfer hoses, which measure15 meters (50 feet) in length and 10 centimeters (4 inches) in diameter. These transfer hoses are provided by the sewage receiving facility. When a ship arrives for berthing, a shore-based handling crew delivers the clean sewage transfer hoses to the pier, and connects the hoses to the pier risers. The ship's crew would be responsible for connecting transfer hoses to the ship's risers on ship-to-shore and ship-to-ship connections. (Virtual Naval Hospital, 2003)

Sewage transfer hoses must be kept clean and in good repair to avoid unsanitary conditions. Prior to returning the hoses to storage after use, they must be cleaned of residual wastewater. This is usually accomplished by flushing the hoses for at least 10 minutes prior to disconnection with high-pressure salt water from the ship's fire fighting system. When a vessel does not have this capability, the shore crew must flush the hoses by connecting them to the nearest salt water pier riser. In addition, hose couplings and exterior surfaces must be cleaned and the ends of the hoses capped prior to storage. Sewage transfer hoses cannot be used for potable water connections. In the event wastewater is spilled onto the deck of the ship or onto the pier, the affected area must be thoroughly flushed with high-pressure salt or fresh water. An approved disinfectant such as NSN 6840-00-753-4797, disinfectant Germicidal Fungicidal concentrate (phenolic type), may be used to prevent or eliminate strong odors caused by the wastewater spill. (Virtual Naval Hospital, 2003)

3.2.12 Visual Resources

Visual resources are defined as the natural and man-made features that constitute the aesthetic qualities of an area. Landforms, surface water, vegetation and man-made features are the fundamental characteristics that define the visual environment and form the overall impression that an observer receives of an area. The importance of visual resources and any changes in the visual character of an area are influenced by social considerations, including the public value placed on the area, public awareness of the area, and community concern for the visual resources in the area.

The visual resources of an area and any proposed changes to these resources can be evaluated in terms of "visual dominance" and "visual sensitivity." Visual dominance describes the level of noticeability that occurs as the result of a visual change in an area. The levels of visual dominance vary from "not noticeable" to a significant change that demands attention and cannot be disregarded. Visual sensitivity depends on the setting of an area. Areas such as coastlines, national parks, and recreation or wilderness areas are usually considered to have high visual sensitivity, whereas heavily industrialized urban areas tend to have the lowest visual sensitivity.

Changes in the existing landscape where there are no identified scenic values or sensitive viewers are considered less than significant. It is also possible to acknowledge a visual change, as possibly adverse, but not significant, because either viewers are not sensitive or the surrounding scenic quality is not high. Visual impacts would also occur if proposed development is inconsistent with existing goals and policies of jurisdictions in which the project is located.

3.2.13 Water Resources

Potentially affected water resources include freshwater surface and ground water resources and marine waters. Water quality and the consumption and diversion of water are regulated by a number of Federal and state agencies. The EPA has the primary authority for implementing and enforcing the Clean Water Act.
(33 USC 1251) The EPA, along with state agencies to which the EPA has delegated some of its authority, issues permits under the Clean Water Act to maintain and restore the quality of our nation's water resources. The Clean Water Act requires permits for activities that result in the discharge of pollutants to water resources or the placement of fill material in waters of the U.S.

Table 3-3 shows the current restrictions for the disposal of wastes into marine waters.

Table 3-3. Discharge Restrictions for U.S. Navy Ships

Type of Waste	U.S. Waters 0-6 kilometers (0-3 nautical miles)	U.S. Contiguous Zone 6 –22 kilometers (3-12 nautical miles)	22-46 kilometers (12-25 nautical miles) from Shore	>46 kilometers (25 nautical miles) from Shore	>93 kilometers (50 nautical miles) from Shore	>370 kilometers (200 nautical miles) from Shore
Blackwater (sewage)	No discharge	Discharge permitted	Discharge permitted	Discharge permitted	Discharge permitted	
Greywater (dishwater)	If vessel collects greywater, should pump at port; if vessel does not collect greywater, direct discharge permitted	Discharge permitted	Discharge permitted	Discharge permitted	Discharge permitted	
Oily Waste	Discharge allowed if no visible sheen present or if oil content monitor (OCM) shows <15 parts per million oil	Same as U.S. Waters	Discharge if OCM <15 parts per million; Ships with oil/water separator (OWS) must process all bilge water through OWS	Same as 22-46 kilometers (12-25 nautical miles)	Same as 22-46 kilometers (12-25 nautical miles)	
Garbage (non-plastic)	No discharge	Discharge pulped garbage	Discharge bagged shredded glass and metal waste >22 kilometers (12 nautical miles)	Discharge permitted	Discharge permitted	
Garbage (plastic, non-food contaminated)	No discharge	No discharge	No discharge	No discharge	No discharge	
Garbage (plastic, food contaminated)	No discharge	No discharge	No discharge	No discharge	No discharge	
Hazardous Materials	No discharge	No discharge	No discharge	No discharge	No discharge	Discharge under certain circumstances; ships should try to retain on-board for shore disposal
Medical Waste	No discharge	No discharge	No discharge	No discharge	If health or safety is threatened, discharge of negatively buoyant sterilized waste permitted	Discharge under certain circumstances; ships should try to retain on-board for shore disposal

Source: U.S. Department of the Navy, 2002

3.3 Resource Areas not Considered Further

Because this proposed action involves the use of the MLP as a mobile platform for testing sensors and launching target and interceptor missiles, the majority of the potential impacts would occur in the BOA. It would therefore not be necessary to consider further environmental impacts to Land Use (including Coastal Zone Management), Environmental Justice and Socioeconomic resources, and Visual and Aesthetic resources. Impacts to Cultural and Historic resources will not be considered further in this analysis because the proposed action would not be expected to impact cultural resources located either above ground or underwater. However, if launch trajectories proposed for a specific test event would cause boosters or debris to be deposited in areas of known underwater cultural resources, additional environmental analysis would be required. These resource areas will not be further addressed in the Affected Environment or the Environmental Consequences sections of this EA.

3.4 Western Range

The Western Range extends 322 kilometers (200 miles) along the California coast and extends over 290 kilometers (180 miles) into the Pacific Ocean. The Western Range includes the Point Mugu Sea Range, the Point Mugu Main Base, Vandenberg AFB, and the Channel Islands (see Figure 3-3).

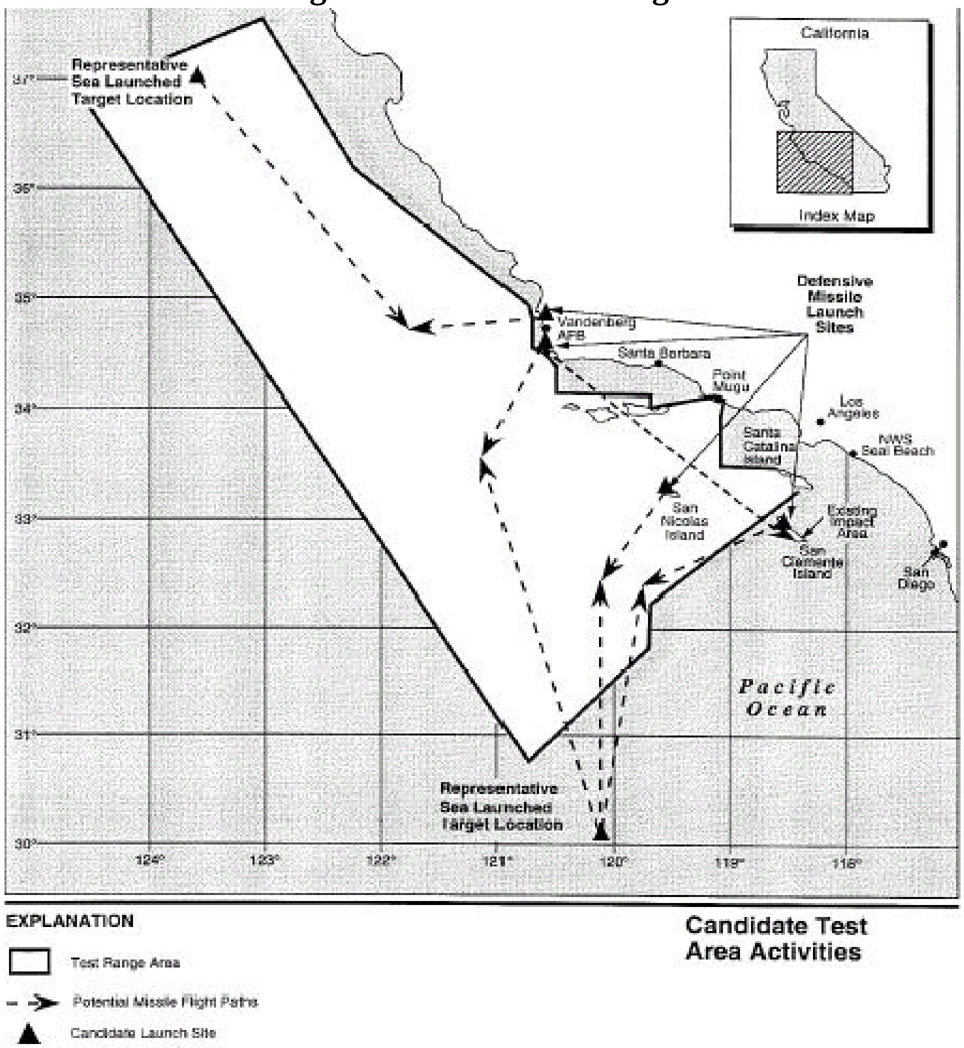
3.4.1 Air Quality

The open ocean areas of the Range generally experience northwesterly surface winds; closer to the coast of the mainland, the winds become more westerly. Sometimes these winds are interrupted by cool seasonal storms with southerly winds; dry offshore storms with southeasterly winds, called Santa Ana winds; coastal eddies during the warm season with southeasterly winds over the inner waters; and alternating land and sea breezes that occur closer to the coast of the mainland.

The temperatures range from 4 degrees Celsius (^{o}C) to 24 ^{o}C (39 degrees Fahrenheit (^{o}F) to 75 ^{o}F) with an annual mean temperature of 14 ^{o}C (58 ^{o}F). Total annual precipitation averages 21.3 centimeters (8.4 inches). The dry season ranges from May to September and the rainy season lasts from November to April.

Existing air emissions in the Western Range include emissions from aircraft operations, missile/target operations, and marine vessel operations. Table 3-4 highlights emissions from these types of operations in the Range during a one-year period.

Figure 3-3. Western Range



Source: U.S. Army Space and Strategic Defense Command, 1994c

Table 3-4. Emissions from Aircraft Operations, Missile/Target Operations, and Marine Vessels in the Range During 1995 in metric tons per year (pounds per year)

	Carbon Monoxide	Nitrogen Oxides (NO_x)	Reactive Organic Gases Hydrocarbon	Sulfur Oxides	Particulate $Matter_{10}$ (PM_{10})
Aircraft operations	7.09 (15,630)	1.71 (3,769)	2.19 (4,828)	0.10 (220)	1.04 (2,293)
Missile/target operations	197.72 (435,897)	6.78 (14,947)	6.12 (13,492)	0.26 (573)	13.93 (30,710)
Marine vessel operations	108.29 (238,739)	259.25 (571,548)	16.23 (35,781)	168.13 (370,663)	28.06 (61,862)
Total	**313.10 (690,267)**	**267.74 (590,266)**	**25.54 (56,306)**	**168.49 (371,457)**	**43.03 (94,865)**

Source: adapted from Department of Navy, 2002

The California Clean Air Act of 1988 established California Ambient Air Quality Standards for criteria pollutants and created additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. The California Air Resources Board (CARB) classifies areas of the state in attainment or nonattainment of the California Ambient Air Quality Standards and is responsible for enforcing the California Ambient Air Quality Standards. In California, air quality is evaluated on a county and regional basis. The state of California is divided into Air Pollution Control Districts and Air Quality Management Districts, which are also called air districts. These agencies are county or regional governing authorities that have primary responsibility for controlling air pollution from stationary sources. (California Air Resources Board, 2003) The CARB requires that each air district develop a strategy for achieving compliance with the National Ambient Air Quality Standards and California Ambient Air Quality Standards.

California is further divided geographically into air basins for the purpose of managing the air resources of the State on a regional basis. An air basin generally has similar meteorological and geographic conditions throughout. The State is currently divided into 15 air basins. Many of the air basins in the coastal region of southern California are in nonattainment for Federal ozone standards. Several factors contribute to this including

- Increases in industrial and automotive activity associated with population growth,
- Stagnant air movement,
- Strong inversions during warm weather, and
- Pollutants migrating from neighboring areas.

The EPA has designated the near shore areas of southern California as unclassified/attainment areas. Because of the lack of major emission sources in the area and the presence of strong northeast winds, the likelihood of pollutants remaining in the ambient air is low.

3.4.2 Airspace

The FAA Los Angeles Air Route Traffic Control Center (ARTCC) controls civil aircraft operating under IFR clearances and transiting the Western Range. Aircraft operating under VFR conditions are not precluded from operating in the Warning Area airspace over the Western Range; however, during hazardous operations every effort is made to ensure that non-participating aircraft are clear of potential hazard areas. The Point Mugu Sea Range includes the restricted areas R-2535A and R-2535B, and eight warning areas (W-289, W-289N, W-290, W-412, W-532, W-537, W-60, and W-61). The airspace in each warning area extends from the surface (sea level) to an unlimited altitude. All, or a portion of these areas, are within international airspace and are active on an intermittent basis through coordination with the FAA. (Department of Navy, 2002) Areas within international airspace follow the procedures of the International Civil Aviation Organization (ICAO). The FAA acts as the U.S. agent for aeronautical information to the ICAO, and the Los Angeles ARTCC manages air traffic in the ROI. Figure 3-4 shows the Western Range and the air traffic corridors in the range.

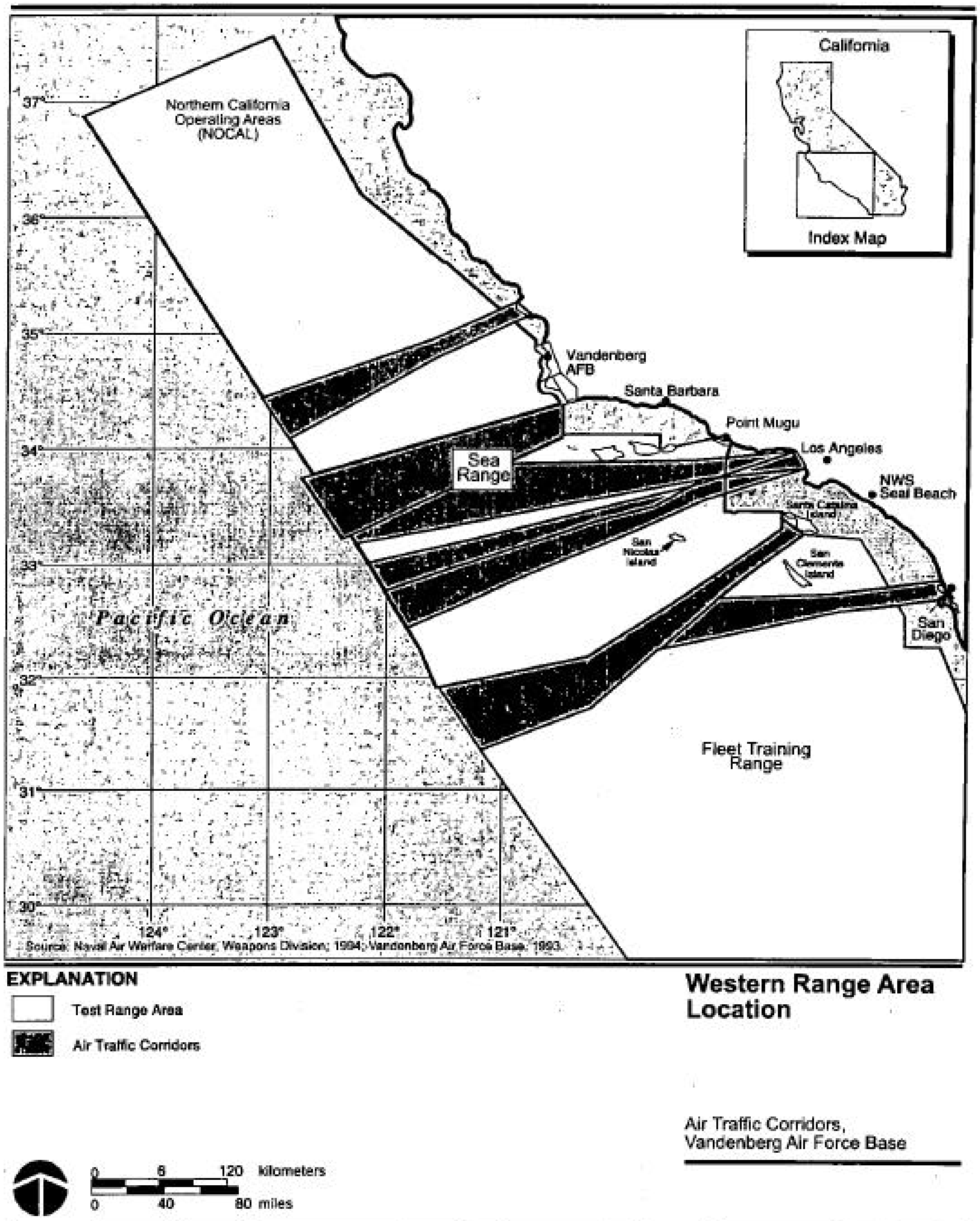
The procedures for scheduling each portion of airspace are performed in accordance with letters of agreement with the controlling FAA facility, Los Angeles ARTCC. Schedules are provided to the FAA facility as agreed between the agencies involved. Aircraft transiting the open ocean portion of the ROI that could be affected by test events would be notified and any necessary rerouting would be accommodated before departing the originating airport. This may require affected aircraft to take on additional fuel before takeoff.

3.4.3 Biological Resources

The shape of the California coastline south of Point Conception creates the Southern California Bight, a broad embayment. The Southern California Bight is influenced by the cold water California Current flowing southward and the warm water California Countercurrent flowing northward. The frequent mixing of these currents results in varied marine life year round. (Department of Navy, 2002) Approximately 480 species of fish inhabit the Southern California Bight. Thirty-four species of cetaceans are known to occur in the region, along with six species of pinnipeds.

Surface sea water often has a pH between 8.1 and 8.3 (slightly basic) but generally is stable with a neutral pH. The amount of oxygen present in sea water varies with the rate of production by plants, consumption by animals and plants, bacterial decomposition, and surface interactions with the atmosphere. Most organisms require oxygen for their life

Figure 3-4. Western Range Air Traffic Corridors



Source: U.S. Army Space and Missile Defense Command, 2002b

processes. Carbon dioxide is a gas required by plants for photosynthetic production of new organic matter. Carbon dioxide is 60 times more concentrated in sea water than it is in the atmosphere.

Phytoplankton or microscopic plants that live in patchy groups at various depths comprise most of the marine flora in the Western Range. Kelp beds also grow from the

sea floor to the surface in the near shore environment. Changes in the abundance of kelp beds have been attributed to a variety of factors including water temperature fluctuation (higher temperatures leading to reductions), nutrient availability, sedimentation, and storm events (strong waves may detach kelp strands from the sea floor).
Several species of clams, as well as sand dollars, can be found in the near shore environment. At greater depths, species of geoduck (*Panopea genorosa*) are also common. In deeper regions, species such as burrowing echluroid *(Listriolobus pelodes*), sea cucumbers, and small deposit feeding bivalves can be found. In the deep regions of the continental shelf, the small clam (*cardita ventricosa*) is common.

In 1980, a 4,294-square kilometer (1,252-square nautical mile) portion of the Santa Barbara Channel was designated as the Channel Islands National Marine Sanctuary. The sanctuary is an area of national significance encompassing the waters that surround Anacapa, Santa Cruz, Santa Rosa, San Miguel and Santa Barbara Islands and extends from mean high tide to 11 kilometers (six nautical miles) offshore around each of the five islands. The sanctuary's primary goal is the protection of natural resources contained within its boundaries. NOAA plans to expand the Channel Islands National Marine Sanctuary off the coast of Vandenberg AFB. The proposed area for this expansion includes an area off the coast of California from south of Point Mugu to north of Point Sal. (NOAA, 2003)

Essential Fish Habitat includes those waters and sediment that are necessary to complete the life cycle for fish from spawning to maturity. There are two Essential Fish Habitat zones in this region, coastal pelagic and groundfish. The east-west boundary for coastal pelagic species (Pacific sardine, mackerel, northern anchovy, jack mackerel, and squid), groundfish (rockfish, shark, and cod), and migratory fish (tunas, marlin, and swordfish) includes all marine and estuary waters from the coast of California to the limits of the Exclusive Economic Zone (322 kilometers, 200 miles offshore) where the U.S. has authority over the management of fisheries.

Threatened and Endangered Species

The near shore environment of the Western Range may support several federally listed threatened or endangered species (see Table 3-5).

Table 3-5. Federally Listed Threatened or Endangered Species within the California Coastal Area

Common Name	Scientific Name	Federal Status
Western snowy plover	*Charandrinus nivosus*	Threatened
California brown pelican	*Pelecanus occidentalis californicus*	Endangered
California least tern	*Sterna antillarum browni*	Endangered
Green sea turtle	*Chelonia mydas*	Threatened
Loggerhead sea turtle	*Caretta caretta*	Threatened
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Olive ridley sea turtle	*Lepidochelys oliveacea*	Threatened
Southern sea otter	*Enhydra lutris nereis*	Threatened
Guadalupe fur seal	*Arctocephalus townsendi*	Threatened

Source: adapted from U.S. Army Space and Missile Defense Command, 2003b

The **Western snowy plover** (*Charandrinus nivosus*) is federally listed as threatened and breeds along the Pacific coast from southern Washington State to southern Baja California, Mexico. The majority of these birds breed along the California coast. The plover nests and forages year-round on the beaches and intertidal zone of San Nicolas Island, which has been designated as critical habitat for the plover. Twenty-eight locations along the California coast have been designated as critical habitat for the plover. Threats to the plover include shoreline modification, recreational activities such as off-road vehicles and beach combing, and loss of nesting habitat. (Sacramento Fish and Wildlife Service, 2003)

The **California brown pelican** (*Pelecanus occidentalis californicus*) is federally and state listed as endangered and breeds in nesting colonies on islands that are free from mammal predators. The nesting colonies range from Baja California to West Anacapa and Santa Barbara Islands. The breeding season is from March to August. Brown pelicans may roost along the Pacific coast from the Gulf of California to Washington State and southern British Columbia. Threats to the California brown pelican include a decline in the food supply because of over-fishing, entanglement with hooks and fishing lines, disturbances at roosting sites, disease, and climate changes. (Sacramento Fish and Wildlife Service, 2003)

The **California least tern** (*Sterna antillarum browni*) is federally and state listed as endangered and is a highly migratory species that is present in California from April to September. It migrates further south during the winter. The least tern nests on sandy beaches close to lagoons and forages in the near shore waters. Threats to the California least tern include habitat loss, human disturbance, predation, and climatic events. (Sacramento Fish and Wildlife Service, 2003)

The **Green sea turtle** (*Chelonia mydas*) is a federally threatened sea turtle found in the eastern North Pacific from Baja California to southern Alaska. Green sea turtles forage in the kelp beds off western San Nicolas Island but there are no known nesting locations on the island. Sea turtles are sighted year round in the Range generally in waters less than 50 meters (164 feet) deep. Populations appear to be highest from July to September. Threats to the Green sea turtle include over-harvesting by humans, habitat loss, fishing net entanglement, boat collisions, and disease. (Sacramento Fish and Wildlife Service, 2003)

The **Loggerhead sea turtle** (*Caretta caretta*) is a federally threatened sea turtle similar to the Green sea turtle. It has been observed in the Western Range at depths up to 1,000 meters (3,280 feet). Juvenile Loggerhead sea turtles are spotted frequently in the Range particularly from July to September but adults are rarely seen in the Range. Threats to Loggerhead sea turtles include exploitation, loss of habitat, fishing practices, and pollution.

The **Leatherback sea turtle** (*Dermochelys coriacea*) is a federally listed endangered species. The Leatherback sea turtle is a highly migratory species and is more pelagic (using deep ocean waters) than other sea turtle species. They may forage in the kelp beds off western San Nicolas Island, but there are no known nesting beaches on the island. They have been observed in the Range at depths of up to 1,000 meters (3,280 feet). They are most common from July to September. Threats to the Leatherback sea turtle include exploitation, loss of habitat, fishing practices, and pollution.

The **Olive ridley sea turtle** (*Lepidochelys oliveacea*) is a federally listed threatened species. (NOAA Fisheries, 2003) The Olive ridley is primarily tropical, nesting from southern Sonora, Mexico to Colombia. These turtles are rarely seen in the waters off the southwestern U.S. They have been observed in the Western Range in waters less than 50 meters (164 feet) but are rarely encountered.

The **Southern sea otter** (*Enhydra lutris nereis*) is federally listed as threatened. The sea otter lives in shallow water along the shores of the North Pacific. Sea otters inhabit intertidal and shallow subtidal zones, often in kelp beds. Sea otters can be found throughout the year in the kelp beds at the west end of San Nicolas Island and in smaller numbers off the north end of the island. Threats to the sea otters include shootings, boat strikes, capture and relocation, oil spills, and other exposures to toxic contaminants.

The **Guadalupe fur seal** (*Arctocephalus townsendi*) is federally listed as threatened. Individuals have been observed in the southern Channel Islands, including San Nicolas Island. The decline in the species appears to have been due to historic commercial hunting.

3.4.4 Geology and Soils

The region immediately off the coast is often referred to as the Continental Borderland. The topographical relief of the Continental Borderland varies by as much as 2,600 meters (8,500 feet) in contrast to other areas where the relief is generally gently sloping. The Continental Borderland extends to the Patton Escarpment, a steep ridge dropping 1,500 meters (4,900 feet) to the deep ocean floor. Between the California coast and the Patton Escarpment are a series of submarine canyons, basins, ridges, banks, and seamounts that provide a unique marine environment. The Channel Islands and the Santa Barbara Channel cut the dominant series of northwest trending basins and ranges. The continental shelf that runs parallel to the California coast is narrow, often less than 8 kilometers (5 miles) wide. In this area the continental shelf sediments are generally 30 meters (100 feet) thick.

3.4.5 Hazardous Materials and Hazardous Waste Management

Test event sponsors would be responsible for safe storage and handling of the materials that they obtain and would comply with all DOT hazardous materials transportation regulations (see 49 CFR). Hazardous materials used in support of test event activities would include propellants, various cleaning solvents, paints, cleaning fluids, fuels, coolants, and other materials. Releases of materials in excess of reportable quantities specified by CERCLA would be reported to the EPA. Material Safety Data Sheets would be available at the use and storage locations of each material. Material Safety Data Sheets provide workers and emergency personnel with the proper procedures for handling or working with a particular substance. They include information such as physical data (e.g., melting point, boiling point, flash point), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill/leak procedures. (Interactive Learning Paradigms Incorporated, 2003)

Test event sponsors would be responsible for tracking hazardous wastes; proper hazardous waste identification, storage, transportation, and disposal; and implementing strategies to reduce the volume and toxicity of the hazardous waste generated. For test events using the MLP, hazardous materials and waste management would be conducted in accordance with all applicable state and Federal regulations as well as Range-specific and U.S. Navy standard operating procedures.

The transport, receipt, storage, and handling of hazardous materials would comply with the Army TM 38-410, Navy NAVSUP PUB 505, Air Force AFR 69-9, Marine Corps MCO 4450-12 or Defense Logistics Agency DLAM 4145.11, *Storage and Handling and Implementing Regulations Governing Storage and Handling of Hazardous Materials*.

3.4.6 Health and Safety

NOTAM and NOTMAR are published and circulated in accordance with established procedures to provide warning to mariners and pilots (including recreational users of the space) that outline any potential impact areas that should be avoided during planned use of the Western Range.

Closures because of launch events are announced over various radio frequencies and posted in harbors along the coast. Procedures have been developed for evacuating or sheltering personnel on offshore oilrigs during launch events. The Minerals Management Service, Department of the Interior is notified of upcoming launch events and in turn, notifies oilrig personnel of future launches. The first notification is given 10 to 15 days before the launch to prepare for sheltering or evacuation and the second notice is given 24 to 36 hours before the launch to confirm the requirement to shelter or evacuate. The oilrig operators are notified to shelter or evacuate personnel based on the results of Rocket Exhaust Effluent Diffusion Model of toxic vapor plumes and potential impact of launch debris.

The Headquarters Air Force Space Command Surgeon General (HQ AFSPC/SG) has recommended exposure criteria for some liquid and solid propellants and their combustion products. HQ AFSPC/SG has also recommended that a risk-management approach be used to develop toxic launch commit criteria consistent with current human toxic exposure criteria. The Eastern and Western Range Safety offices developed a toxic risk management strategy which keeps exposure criteria less than or equal to $30x10^{-6}$ and individual risk less than or equal to $1x10^{-6}$. This approach considers the probability of catastrophic failure, concentration, direction, dwell time, and emergency preparedness procedures. This level of risk is equivalent to the risk estimated for the overflight of conventional aircraft.

Before a test event is allowed to proceed, the range must be verified cleared of non-participants using inputs from ship sensors, visual surveillance of the range/area from aircraft, and radar data. In addition, all activities must be in compliance with DoD Directive 4540.1 (*Use of Airspace by U.S. Military Aircraft and Firings Over the High Seas*), which specifies procedures for conducting aircraft operations and for missile/projectile firings. (DoD, 2002)

3.4.7 Noise

Baseline or ambient noise levels on the ocean surface, not including localized noise attributed to shipping, air traffic, sonic booms, and missile launches, are a function of local and regional wind speeds. Studies of ambient ocean noise have found that the sea surface is the predominant noise source and is associated with the breaking of waves.

Wave breaking is further correlated to wind speed, resulting in a relationship between noise level and wind speed.

Common noise occurrences on the open ocean associated with human activities includes noise from ship and vessel traffic. This may include transiting commercial tankers and container ships, commercial fishing boats, and military surface vessels and aircraft. Vessel noise is primarily associated with propeller and propulsion machinery. (DoD, 2002)

Typical wind speeds for the eastern portion of the Pacific Ocean range from 2 to 13.5 meters/second (5 to 30 miles per hour). (National Imagery and Mapping Agency, 1998 and Cato, et al., 1994) These wind speeds correspond to a noise level range of approximately 55 dB to 68 dB. Observed seasonal changes in winds usually do not include changes in wind speed, but rather wind direction. (National Imagery and Mapping Agency, 1998) Storms and other weather events, however, would increase localized wind speed and therefore, would increase the noise level for the duration of the weather event.

Generators on the MLP could be expected to have peak noise levels of 96 dBA and attenuate to 80 to 89 dBA 15 meters (50 feet) from the source.

3.4.8 Transportation and Infrastructure

Once a shipping vessel leaves the navigation lanes leading to sea, there are no regulations or directions obliging commercial vessels to use specific cross-ocean shipping lanes. NOTMARs can be issued to warn vessels of test events occurring in the area.

Power on the MLP is supplied by two 750-kilowatt diesel-powered generators. Generators are maintained to ensure longevity, peak performance, and reduced costs of replacement. Fresh water is carried on the ship using both existing ship holding tanks and bottled drinking water. The MLP carries enough water to supply 100 people for up to 21 days.

Wastewater is held in existing ship holding tanks when the MLP is within the regulatory distance (6 to 22 kilometers [3 to 12 nautical miles]) from the shore. Normal ship solid wastes, including food waste, generated onboard are handled in compliance with the International Convention for the Prevention of Pollution (in compliance with MARPOL 73/78). All other solid waste is stored onboard and disposed of at appropriate land-based facilities.

3.4.9 Water Resources

General composition of the waters in the Pacific includes water, sodium chloride, dissolved gases, minerals, and nutrients. The salinity in this region of the Pacific Ocean is approximately 35 parts of salt per 1,000 parts of seawater. In this region of the Pacific Ocean, water temperatures vary from 12 ^{o}C (54 ^{o}F) in the winter to 21 ^{o}C (70 ^{o}F) in the summer. Surface sea water often has a pH between 8.1 and 8.3 (slightly basic), but is generally very stable with a neutral pH. The amount of oxygen present in the sea water varies with the rate of production of plants, consumption of oxygen by plants and animals, bacterial decomposition, and surface interaction with the atmosphere. Carbon dioxide is 60 times more concentrated in sea water than it is in the atmosphere.

The ocean water in the Western Range has a high buffering capability due in part to the dissolved elements such as carbon and hydrogen. Typically, the pH of sea water remains between 7.5 and 8.5. Marine surface water tends to have a high dissolved oxygen level as a result of photosynthetic activity and wave mixing. The dissolved oxygen levels are usually between 5.4 and 5.9 milliliters per liter, while deeper waters are typically between 0.4 and 0.6 milliliters per liter. (Department of Navy, 2002)

Major nutrients in water include dissolved nitrogen, phosphates, and silicates. Dissolved inorganic nitrogen occurs as nitrates, nitrites, and ammonia, with nitrates being most common. The nitrate concentration of water in the near shore environment varies annually from 0.1 to 10.0 micrograms per liter with the lowest concentrations occurring in the summer months. At a depth of 10 meters (33 feet), concentrations of phosphate and silicate in the near shore environment range from 0.25 to 1.25 micrograms per liter, respectively.

The Clean Water Act prevents the release of hazardous substances into or upon U.S. waters out to 200 nautical miles (370 kilometers) from the shore. Shipboard waste handling procedures for commercial and U.S. Navy vessels govern the discharge of non-hazardous waste. The EPA has proposed Uniform National Discharge Standards (UNDS) for military vessels. Table 3-3 shows the current restrictions for disposal of shipboard wastes from U.S. Navy ships.

The water quality in the coastal environment of the Western Range is generally high. (Department of Navy, 2002) Most marine water pollution in the region comes from municipal discharges. Therefore, water quality may deteriorate closer to shore because many of the pollutants settle on the shelves and basins near the mainland. The oil and gas development industry located in the Western Range may serve as a potential source of pollution.

3.5 Pacific Missile Range Facility

The PMRF range is located in Hawaii on and off the western shores of the Island of Kauai and includes broad ocean areas to the north, south, and west. The main base of PMRF is located on the west side of Kauai, approximately 222 kilometers (120 nautical miles) from Pearl Harbor. PMRF consists of 3,425 square kilometers (1,000 square nautical miles) of instrumented underwater ranges and 144,000 square kilometers (42,000 square nautical miles) of controlled airspace. Figure 3-5 shows the location of the temporary operating area for the PMRF.

3.5.1 Air Quality

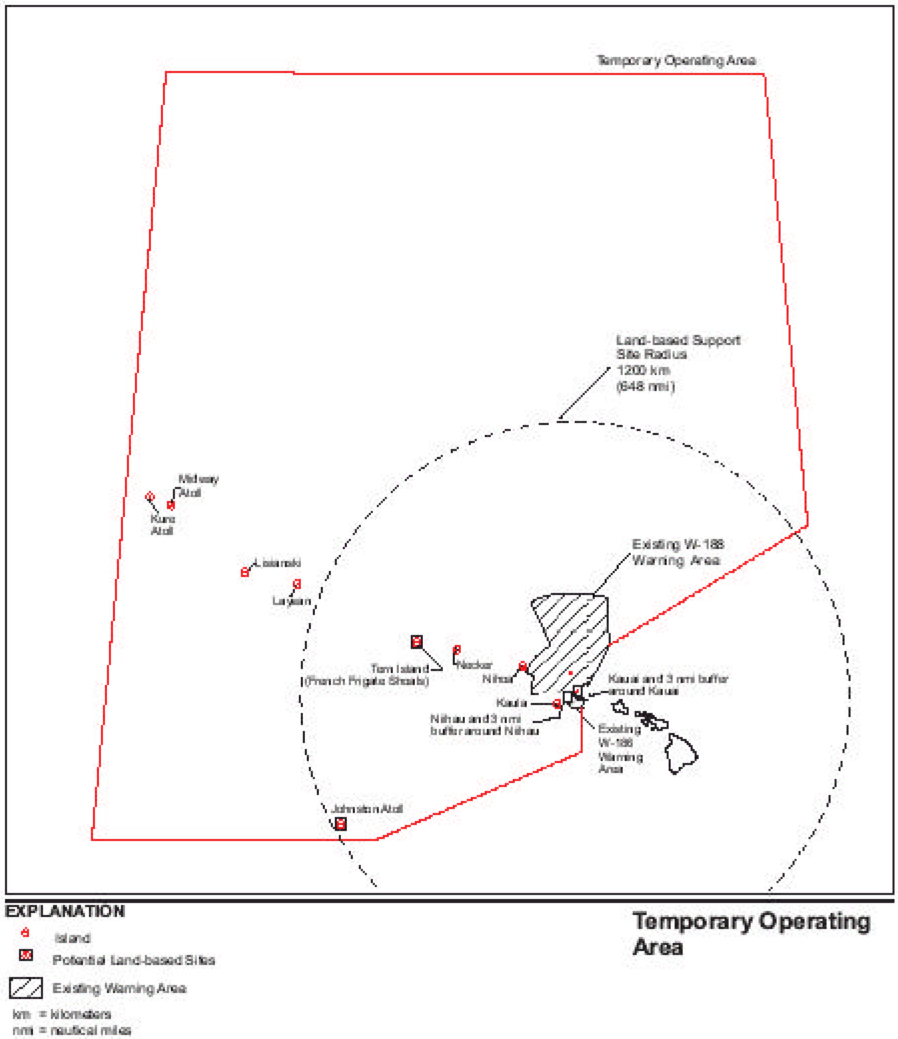
The climate at the PMRF is mild and semitropical, which affects the dispersion of air pollutants and the air quality of the area. Hawaii is located at the edge of the tropical zone within the belt of the cooling northeasterly trade winds. The trade winds prevail over Kauai during all months of the year.

The mean annual temperature is in the 21 to 26 ^{o}C (70 to 78 ^{o}F) range. Annual rainfall levels on Kauai range from 1,234 centimeters (468 inches) at the top of Mount Waialeale to approximately 52 centimeters (20 inches) on the western side of the island, where PMRF is located. The majority of rainfall occurs during the October through April wet season.

The only sampling station on Kauai, which monitors for PM_{10}, is located in Lihue. The area around the PM_{10} sampling station located in Lihue is classified as being in attainment for both National and State Ambient Air Quality Standards. However, the city of Lihue is 42 kilometers (26 miles) from PMRF and is on the southeast side of the island; thus, air quality measurements there may not be representative of air quality at PMRF.

The main air pollution sources on the land-based portions of the PMRF are diesel-powered generators, aircraft, and rocket launches. PMRF was issued a Title V Covered Source Permit for five diesel generators, which covers all significant stationary emissions sources on PMRF. Aircraft emissions and missile exhaust emissions are both considered mobile sources and are thus exempt from National or State permitting requirements.

Figure 3-5. Temporary Operating Area for the PMRF



Source: U.S. Department of the Navy, 1998

3.5.2 Airspace

The special use airspace at the PMRF consists of Restricted Areas R-3101, which lies immediately above PMRF/Main Base and to the west of Kauai, and R-3107, which lies over Kaula, a small uninhabited rocky islet 35 kilometers (19 nautical miles) southwest of Niihau. The special use airspace also includes Warning Areas W-188 north of Kauai and W-186 southwest of Kauai, all controlled by PMRF. Warning Areas W-189 and W-190 north of Oahu and W-187 surrounding Kaula are scheduled through the Fleet Area Control and Surveillance Facility.

Table 3-6 lists the affected Restricted Areas and Warning Areas and their effective altitudes and times used. The controlling agency for the Restricted Areas and Warning Areas is the Honolulu Combined Center Radar Approach Control.

Table 3-6. Special Use Airspace in PMRF Airspace ROI

Number	Location	Altitude (meters [feet])	Time of Use	
			Day	Hours
R-3101	PMRFAC FOUR	To Unlimited	Monday-Friday	6 am-6 pm
R-3107	Kaula	To Flight Level 180 (5,500 meters [18,000 feet] above MSL)	Monday-Friday	7 am-10 pm
W-186	Hawaii	To 9,000	Continuous	Continuous
W-187	Hawaii	To 18,000	Monday-Friday and Saturday-Sunday	7 am-10 pm and 8 am-4 pm
W-188	Hawaii	To Unlimited	Continuous	Continuous
W-189	Hawaii	To Unlimited	Monday-Friday and Saturday-Sunday	7 am-10 pm and 8 am-4 pm
W-190	Hawaii	To Unlimited	Monday-Friday and Saturday-Sunday	7 am-10 pm and 8 am-4 pm

Source: U.S. Department of the Navy, 1998

En Route Airways and Jet Routes

Two IFR en route low altitude airways used by commercial air traffic pass through the airspace in the ROI, V-15, which passes east to west through the southernmost part of Warning Area W-188, and V-16, which passes east to west through the northern part of Warning Area W-186 and over Niihau.

Airports and Airfields

There are two airfields in the ROI, the PMRF/Main Base, and the Kekaha airstrip, which is approximately 4.8 kilometers (3 miles) to the southeast of PMRF and 3.2 kilometers (2 miles) northeast of Kekaha.

3.5.3 Biological Resources

There are coral reefs off the coasts of Kauai, Niihau, Kaula, and Tern Islands, and the atoll reefs that make up Johnson Atoll. Coral reefs are protected through E.O. 13089 on Coral Reef Protection, which requires all Federal agencies whose actions may affect U.S. coral reef ecosystems to "identify their actions that may affect U.S. coral reef ecosystems;

utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and to the extent permitted by law, ensure that any actions they authorize, fund, or carry out will not degrade the conditions of such ecosystems."

Threatened and Endangered Species

Federally listed threatened or endangered marine mammals and sea turtle species found within the Hawaiian coastal area are listed in Table 3-7.

Table 3-7. Federally Listed Threatened or Endangered Species within the Hawaiian Coastal Area

Common Name	Scientific Name	Federal Status
Sei whale	*Balaenoptera borealis*	Endangered
Blue whale	*Balaenopter musculus*	Endangered
Fin whale	*Balaenoptera physolus*	Endangered
Humpback whale	*Megaptera novaeangliae*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Hawaiian monk seal	*Monochus schauinsladi*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
Green sea turtle	*Chelonia mydas*	Threatened
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Olive ridley sea turtle	*Lepidochelys olivacea*	Threatened

Source: Mobley, 1997 in U.S. Department of Navy, 1998

The **Sei whale** (*Balaenoptera borealis*) is federally listed as endangered and is commonly found in the open ocean waters. Threats to the Sei whale include take by commercial whalers, offshore drift gillnet fisheries, and ship strikes.

The **Blue whale** (*Balaenoptera musculus*) is federally listed as endangered. It spends winters in the eastern north Pacific Ocean from central California northward to the Gulf of Alaska. Threats to the blue whale include historic whaling practices, offshore drift gillnet fishing, and ship strikes.

The **Fin whale** (*Balaenoptera physalus*) is federally listed as endangered. Threats to fin whales include historic whaling practices, offshore drift gillnet fishing, and ship strikes.

The **Humpback whale** (*Megaptera novaengliae*) is federally listed as endangered.

The **Sperm whale** (*Physeter macrocephalus*) is federally listed as endangered. Threats to the Sperm whale include historic whaling practices, offshore gillnet fishing, and ship strikes.

The **Hawaiian monk seal** (*Monachus schauinslandi*) is a federally listed Endangered species. It is the most endangered seal in U.S. waters and after the northern right whale, it is also the nation's most endangered marine mammal. Hawaiian monk seals occur only in the Hawaiian archipelago, where pupping habitat is limited almost exclusively to the chain of small, mostly uninhabited islands and atolls extending some 1,931 kilometers (1,200 miles) northwest of the main Hawaiian Islands. The seals require undisturbed sandy beaches to haul out to rest, give birth, and nurse their young. (PMRF Enhanced Capability Final EIS)

The **Hawksbill sea turtle** (*Eretmochelys imbricata*) is a federally listed Endangered species. Hawksbill sea turtles occur in Hawaiian coastal waters year round. They are known to nest on the main islands, primarily on several small sand beaches on the islands of Hawaii and Molokai. (PMRF Enhanced Capability Final EIS)

For a description of Loggerhead, Green, Leatherback, and Olive Ridley sea turtles please refer to Section 3.4.3.

Special Habitats

The Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) was established via congressional legislation in 1992. Humpback whales (*Megaptera novaeangliae*) are endangered marine mammals and are therefore protected under provisions of the Endangered Species Act and the Marine Mammal Protection Act wherever they are found. Humpback whales are present in the winter months in the shallow waters surrounding the Hawaiian Islands where they congregate to mate and calve. By agreement with the Governor of the State of Hawaii in 1997, NOAA Sanctuaries and Reserves Division modified the Congressional-mandated boundary of the HIHWNMS so that it included certain portions of the shallow water along northern Kauai. Regulations implementing designation of the sanctuary specifically recognize that all existing military activities outlined or external to the sanctuary are authorized, as are new military activities following consultation with NOAA Fisheries. (62 Federal Register (FR) 14816, 15 CFR §922.183)

A submerged barrier reef that is roughly 12.9 kilometers (8 miles) long and composed of fossil coral (*Porites compressa*) lies just offshore of PMRF. The reef has a very irregular appearance resulting from numerous ledges, walls, slumped limestone blocks, and mounds. Coral and fish diversity is low within the area as a result of deep water, low coral density, and seasonal sand scouring. Fish associated with the low vertical relief habitat include the bluestripe snapper (*Lutjanus kasmira*) and several species of burrowing blennies. Pelagic fish in the region include jacks, amberjack (*Seriola dumerili*), and flying fish.

3.5.4 Geology and Soils

The Island of Kauai is the result of a massive shield volcano, part of the chain of similar volcanoes that migrated northwest to southeast to form the Hawaiian archipelago. Kauai is the oldest of the eight main islands. Volcanic rocks exposed in the western half of the island are composed of Pliocene basaltic flows of the Waimea Volcanic Series. Coral reefs developed upon the eroded platform around the island when the sea was about 1.5 meters (5 feet) above its current level. Wave action has eroded the coral surface, creating a primary source for beach sand that is actively being deposited and reworked along the shoreline.

Coastal erosion is a widespread, chronic, and locally severe problem in the Hawaiian Islands and elsewhere in U.S. Pacific tropical environments. The beaches in Hawaii derive most of their sediment from the surrounding reefs, and factors that affect the growth and health of living reefs, such as deterioration in water quality or severe storms, can have an adverse effect on beach sediment supply. (U.S. Geological Survey, 2003)

The ocean floor of the central Pacific basin is relatively uniform, with a mean depth of about 4,270 meters (14,000 feet). The major irregularities in the area are the extremely steep-sided, flat-topped submarine peaks known as seamounts. (Wikipedia.org, 2003) Seamounts are mountains rising from the seafloor that do not reach the surface of the ocean.

The Andesite Line is the most significant regional feature in the Pacific Ocean. It separates the deeper, basic igneous rock of the Central Pacific Basin from the partially submerged continental areas of acidic igneous rock on its margins. (Wikipedia.org, 2003) Within the Andesite Line are most of the deep troughs, submerged volcanic mountains, and oceanic volcanic islands that characterize the Central Pacific Basin. In this region, basaltic lavas gently flow out of rifts to build huge dome-shaped volcanic mountains whose eroded summits form island arcs, chains, and clusters.

3.5.5 Hazardous Materials and Hazardous Waste Management

Test event sponsors would be responsible for safe storage and handling of the materials that they obtain and would comply with all DOT hazardous materials transportation regulations (see 49 CFR). Refer to Section 3.4.5 for additional information on hazardous materials and hazardous waste management for test events using the MLP.

3.5.6 Health and Safety

All reasonable precautions would be taken during test events to prevent injury to human life or property. Safety precautions and standards exist for the following areas: Fire and Crashes, Aircraft, Range, Ordnance, Area Clearance (land and ocean), KTF, and Transportation.

Range Safety officials ensure operational safety for projectiles, targets, missiles, and other hazardous operations into PMRF operational areas in the Ocean Area. The operational areas consist of two Warning Areas (W-186 and W-188) and one Restricted Area (R-3101) under the local control of PMRF. The Warning Areas are in international waters and are not restricted; however, the surface area of the Warning Areas is listed as "HOT" (actively in use) 24 hours a day. For special operations, multi-participant or hazardous weekend firings, PMRF publishes dedicated warning NOTMARs and NOTAMs one week before hazardous operations. In addition, a 24-hour recorded message is updated daily by Range Operations to inform the public when and where hazardous operations will take place. Before an operation is allowed to proceed, the range is verified cleared of non-participants using inputs from ship sensors, visual surveillance from aircraft and range safety boats, radar data, and acoustic information from a comprehensive system of sensors and surveillance from shore. If whales are present in the operation areas, activities are stopped until the mammals have cleared the area. In addition, all activities must be in compliance with DoD Directive 4540.1 (*Use of Airspace by U.S. Military Aircraft and Firings Over the High Seas*, dated January 13, 1981), which specifies procedures for conducting aircraft operations and for missile/projectile firing.

3.5.7 Noise

Ambient noise levels on the ocean surface are typically a function of local and regional wind speeds. The sea surface is the predominant source of noise, especially breaking waves. Noise in the ROI associated with human activities would be associated with ship and vessel traffic. This may include transiting commercial tankers and container ships, commercial fishing boats, and military surface vessels and aircraft.

Sources of noise include the engines for the tug vessel and the 750-kilowatt generators on the MLP. The generators could reach peak noise levels of 96 dBA and attenuate to 80 to 89 dBA 15 meters (50 feet) from the source.

3.5.8 Transportation and Infrastructure

A large portion of the U.S.' trade in raw materials and finishing products is carried through the northern Pacific Ocean. In 1996, about 21 percent of all commercial vessels importing and exporting goods to and from the U.S. to 30 ports departed from, or were bound for, ports on the U.S. Pacific seaboard. The large majority of these vessels crossed the northern Pacific Ocean to and from the large trading ports of Asia. This is discussed in more detail in the 1998 PMRF Enhanced Capability EIS.

There are no regulations or directions forcing commercial vessels to follow specific cross-ocean lanes. Once a vessel leaves the navigation lanes leading out to the open sea, the majority of shipping follows the shortest route between the two ports.

Infrastructure on the MLP is described in Section 2.1.1.

3.5.9 Water Resources

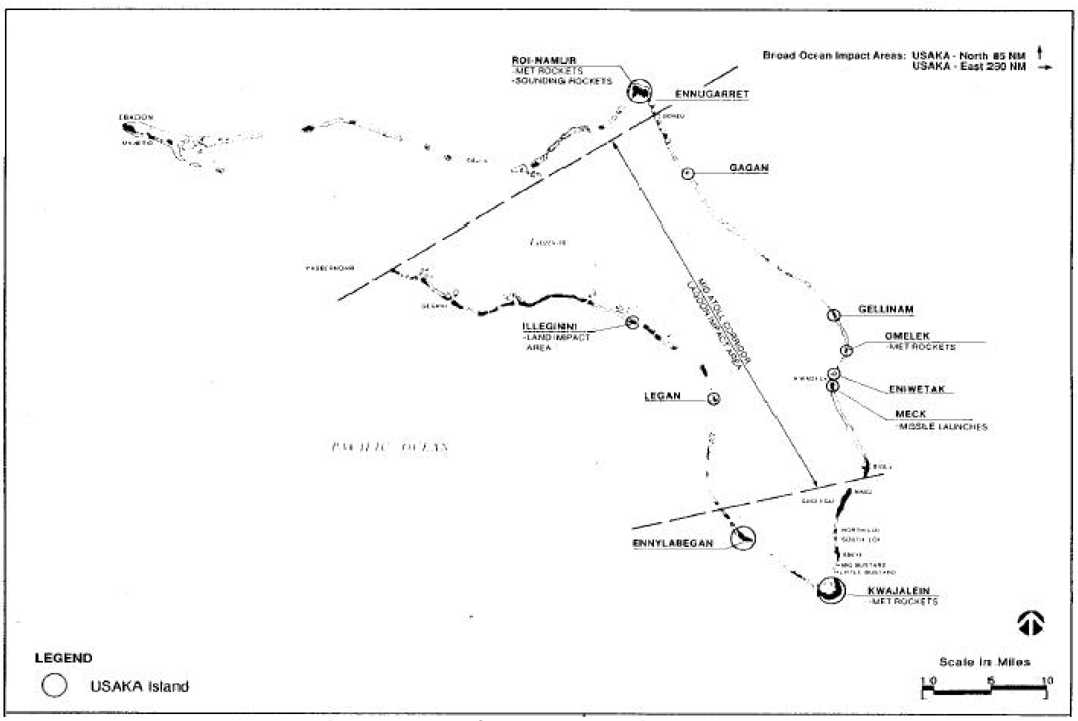
Water near the equator tends to have lower salinity than that found in the mid-latitudes of the Pacific Ocean because of abundant equatorial precipitation throughout the year. (Wikipedia.org, 2003)

3.6 Republic of the Marshall Island USAKA/RTS

USAKA/RTS is comprised of USAKA test facilities, Wake Island test facilities, the open sea area between the two facilities, and the open sea area south of USAKA. USAKA is located approximately 1,126 kilometers (700 miles) south of Wake Island and approximately 3,379 kilometers (2,100 miles) southwest of Hawaii. Wake Island is located approximately 3,219 kilometers (2,000 miles) west of Hawaii. USAKA is located in the Republic of the Marshall Islands. See Figure 3-6 for a map showing the location of islands within USAKA.

Wake Island was designated as a National Historic Landmark in 1985 to preserve both the battlefield where important World War II events occurred and Japanese and American World War II structures. (U.S. Army Space and Missile Defense Command, 2002c) The historic property boundary is defined as the outer edge of the reef that surrounds Wake Island so as to include the reef, the three islands, and the lagoon.

Figure 3-6. Map of USAKA



Source: U.S. Army Space and Strategic Defense Command, 1993

3.6.1 Air Quality

<u>USAKA.</u> The region exhibits a tropical marine climate characterized by relatively high annual rainfall and warm to hot, humid weather throughout the year. Trade winds are dominant throughout the year, and are strongest from November to June. The prevailing winds blow from the east to the northeast with an average speed of 26 kilometers (16 miles) per hour in the winter and 10 kilometers (9 miles) per hour in the summer. The mean annual temperature is 28 ^{o}C (82 ^{o}F).

The primary pollution sources in the region are power plants, fuel storage tanks, solid waste incinerators, and vehicles operating on the islands within the region. Rocket launches are generally a small source of emissions. Because of the relatively small quantity and types of air pollution sources, the dispersion caused by trade winds, and the lack of topographic features that inhibit dispersion, air quality is considered good (i.e., well below the maximum pollution levels established for air quality in the U.S.). (U.S. Army Space and Missile Defense Command, 2003b)

<u>Wake Island.</u> Easterly trade winds, with an annual average wind speed of 22.2 kilometers (13.9 miles) per hour, influence the climate around Wake Island. Approximately 89 centimeters (35 inches) of precipitation falls annually and the average annual humidity ranges from 69 to 80 percent. Temperature varies little throughout the year. February is typically the coolest month of the year with an average daily high of 27.6 ^{o}C (81.7 ^{o}F) and an average daily low of 21.9 ^{o}C (71.5 ^{o}F). There are no ambient air quality monitoring data available for the area around Wake Island; however, there are no air pollution problems at Wake Island because of the strong trade winds, which disperse any local emissions. Wake Island's primary pollution emission sources are power plants, motor vehicle exhaust, aircraft operations, fuel storage tanks, open burning of trash, and infrequent rocket launches. The small reverse osmosis unit at the water plant is a minor source of air emissions. (Wake Island Master Plan, Long Range Component, 2000 as cited in U.S. Army Space and Strategic Defense Command, 2002c)

3.6.2 Airspace

Both USAKA and Wake Island and the surrounding areas are located in international airspace; and therefore, the procedures of the International Civil Aviation Organization (ICAO) are followed. ICAO Document 4444 is the equivalent air traffic control manual to the FAA Handbook 7110.65, *Air Traffic Control*. The ICAO is not an active air traffic control agency and has no authority to allow aircraft into a particular sovereign nation's Flight Information Region or Air Defense Identification Zone and does not set international boundaries for air traffic control purposes. The ICAO is a specialized agency of the United Nations whose objective is to develop the principles and techniques of international air navigation and to foster planning and development of international civil air transport. The FAA acts as the U.S. agent for aeronautical information to the

ICAO. The airspace in the ROI is managed by Oakland ARTCC in its Ocean Control-5 Sector.

3.6.3 Biological Resources

<u>USAKA</u>. There are five species of giant clams found throughout the marine environment in the Kwajalein Atoll area. The largest species (*Tridacna gigas*) was observed during a 1998 inventory. (U.S. Department of the Army, 2001) The species has been significantly reduced in numbers. All species of mollusks in the family Tridacnidae are listed as protected under the Convention for the International Trade on Endangered Species. (U.S. Fish and Wildlife Service, 2002) A single species of rare sea grass is found in the lagoons of Kwajalein and Roi-Namur.

Large numbers of migrating shorebirds have been observed at Kwajalein, including the Pacific golden plover (*Pluvialis fulva*) and the ruddy turnstone (*Arenaria interpres*). Since 1996, the only seabird observed breeding on Kwajalein has been the white tern. Black noddies (*Anous minutus*) and great crested terns (*Sterna bergii*) have been observed foraging in the main harbor and along the northwestern coastline, respectively. (U.S. Department of the Army, 2001)

Threatened and Endangered Species

<u>USAKA</u>. Green sea turtles (*Chelonia mydas)* and Hawksbill sea turtles (*Eretmochelys imbricate)* enter the Kwajalein lagoon and are commonly present in the harbors at Kwajalein. Little nesting activity has been observed on the USAKA islands in recent years. Other threatened and endangered marine species that may reside in and around USAKA include the Leatherback sea turtle (*Dermochelys coriacea*), Loggerhead sea turtle (*Caretta caretta*), and Olive ridley sea turtle (*Lepidochelys olivacea*) (see Table 3-8).

Table 3-8. Federally Listed Threatened or Endangered Species within the USAKA Coastal Area

Common Name	Scientific Name	Federal Status
Green sea turtle	*Chelonia mydas*	Threatened
Hawksbill sea turtle	*Eretmochelys imbricate*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
Olive ridley sea turtle	*Lepidochelys olivacea*	Threatened

Source: adapted from U.S. Army Space and Missile Defense Command, 2002c

For a description of Green, Leatherback, Loggerhead, and Olive Ridley sea turtles please refer to Section 3.4.3. For a description of Hawksbill sea turtles please refer to Section 3.5.3.

<u>Wake Island.</u> A 1989 National Marine Fisheries study indicated that potential sea turtle habitat exists along the outer reef face and deeper patch reefs of Wake Island. (THAAD Pacific Flight Test EA, 2002) The Green sea turtle (*Chelonia mydas*) is the only species confirmed to reside at the island. In addition to the Green sea turtle, three other federally listed sea turtle species may occasionally visit the atoll: the Loggerhead turtle (*Caretta caretta*), the Leatherback turtle (*Dermochelys coriacea*), and the Hawksbill turtle (*Eretmochelys imbricata*) (see Table 3-9). The pacific Bottlenose dolphin (*Stenella longirostris*) and Cuvier's beaked whale (*Ziphius cavirostris*) occur near the atoll and are protected under the Marine Mammal Protection Act.

Table 3-9. Federally Listed Threatened or Endangered Species within the Wake Island Coastal Area

Common Name	Scientific Name	Federal Status
Green sea turtle	*Chelonia mydas*	Threatened
Hawksbill sea turtle	*Eretmochelys imbricate*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
Pacific bottlenose dolphin	*Tursiops truncatus*	Protected under Marine Mammal Protection Act
Cuvier's beaked whale	*Ziphius cavirostris*	Protected under Marine Mammal Protection Act

Source: adapted from U.S. Army Space and Missile Defense Command, 2002c

The **Pacific bottlenose dolphin** (*Tursiops truncatus*) is protected under the Marine Mammal Protection Act. Bottlenose Dolphins are both a coastal and oceanic species, with the former preferring waters of less than 30 meters in depth. The habitats they occupy are diverse, ranging from rocky reefs to calm lagoons and open waters. (Cetacea.org, 2004) Threats to Pacific bottlenose dolphins include exploitation, loss of habitat, fishing practices, and pollution.

Cuvier's beaked whale (*Ziphius cavirostris*) is protected under the Marine Mammal Protection Act. This is a deepwater species that is rarely seen in coastal waters. (Gulf of Mexico, 2004)

For a description of Green, Leatherback, and Loggerhead sea turtles please refer to Section 3.4.3. For a description of Hawksbill sea turtles please refer to Section 3.5.3

3.6.4 Geology and Soils

<u>USAKA.</u> The geology of Kwajalein Atoll is typical of Micronesian atolls. There is a shallow reef flat, on the seaward side of the island, which extends to a seaward reef slope.

The windward (north and east) side of the atoll, which is subjected to stronger wind and waves, is characterized by well-defined ridges and channels. Seaward side beaches are generally composed of gravel- to cobble-sized material, while lagoon-side beaches are more often composed of sand.

The reefs and islands of the region consist entirely of the remains of coral reef rock and sediments to a thickness of several thousand feet atop submarine volcanoes, which formed 70 to 80 million years ago. As the volcanoes became extinct and began to subside, living coral reefs grew and formed atolls. The reef rock is formed entirely from the remains of marine organisms that secrete external skeletons of calcium and magnesium carbonates. Land areas on reefs that project above high tides are formed by large waves breaking loose reef materials and throwing them on shallow flats and/or a lowering of sea level. As a result, the maximum elevation of atolls above sea level is generally less then 4.6 meters (15.1 feet). The ocean floor of the central Pacific basin is relatively uniform, with a mean depth of about 4,270 meters (14,000 feet). The western part of the floor consists of mountain arcs that rise above the sea as island groups and deep trenches. Most of the deep trenches lie adjacent to the outer margins of the wide western Pacific continental shelf. (Encyclopedia.com, 2003)

Wake Island. Wake Island is typical of mid-Pacific Ocean atolls formed when a volcano rises above the sea surface and then subsides back below the surface due to deflation of the underlying magma chamber. The maximum elevation on Wake Island is 6 meters (21 feet) above mean sea level, and the average elevation is approximately 3 meters (10 feet). This makes the island susceptible to damage from high waves and winds generated by tropical storms.

The reef rock is formed entirely from the remains of marine organisms (reef corals, coralline algae, mollusks, echinoderms, foraminiferans, and green sand-producing algae) that secrete external skeletons of calcium and magnesium carbonates. The landmasses at Wake Island have formed by accumulation of reef debris deposited on the lagoon side of the reef by large waves or by the lowering of sea levels during periods of global cooling.

3.6.5 Hazardous Materials and Hazardous Waste Management

Test event sponsors would be responsible for safe storage and handling of the materials that they obtain and must adhere to all DOT hazardous materials transportation regulations see 49 CFR. Refer to Section 3.4.5 for additional information on hazardous materials and hazardous waste management for test events using the MLP.

3.6.6 Health and Safety

USAKA. All program operations must receive the approval of the USAKA/RTS Safety Office. All safety analyses, standard operating procedures, and other safety documentation applicable to those operations affecting USAKA must be provided, along with an overview of mission objectives, support requirements, and schedule. Prior to operations, which may involve impact of objects within the range, an evaluation would be made to ensure that populated areas, critical range assets, and civilian property susceptible to damage are outside predicted impact limits. NOTMARs and NOTAMs would be published and circulated in accordance with established procedures to provide warning to personnel concerning any potential hazard areas, which should be avoided. Radar and visual sweeps of hazard areas would be accomplished immediately prior to operations to assist in the clearance of noncritical personnel.

Wake Island. The provisions of Air Force Policy Directives 91-2, Safety Programs dated 28 Sep 1993 and 91-3, Occupational Safety and Health dated 27 Sep 1993 would apply to test events at Wake Island..

The missile range extending from Wake Island toward the USAKA is under the jurisdiction of the RTS. The USAKA controls all range operations, and all procedures are conducted in accordance with the USAKA Range Safety Manual (U.S. Army Space and Strategic Defense Command, 1993) and USAKA policies and procedures. In the event of a catastrophic event (e.g., natural disaster, hazardous materials spill, aircraft or missile mishap), Operations Plan 355-1, Wake Island Disaster Preparedness Plan, would be implemented.

3.6.7 Noise

The primary noise sources in the ocean portion of the range are natural sounds, including wind. Additional sources of noise include the tug vessel for the MLP, the 750-kilowatt diesel generators on the MLP, and possible noise from the launched missiles.

USAKA. Primary sources of noise associated with USAKA include missile launches, aircraft, power plants, marine sandblasting and service, air conditioning units, and small diesel engine generators.

Wake Island. Natural background sound levels on Wake Island are relatively high due to wind and surf. Studies of ambient noise in oceanic regions have found that the sea surface is the predominant source of noise and that the source is associated with the breaking of waves. Wave breaking is further correlated to wind speed, resulting in a relationship between noise level and wind speed. (Cato, et al., 1994, as referenced in DOT, 2001) The noise environment is also affected by infrequent missile launches.

3.6.8 Transportation and Infrastructure

USAKA. Kwajalein Island is the base for receiving cargo and fuel for USAKA and has the highest levels of marine transport activity. Two high-speed catamaran ferries, five landing craft mechanized vessels, two landing craft utility vessels, and additional smaller boats provide passenger transportation between the islands.

Wake Island. Sea-going barges and ships provide the majority of the transportation around Wake Island. Airplanes also provide passenger and cargo service to Wake Island. The U.S. Air Force maintains three small landing barges used to transfer material from ships to the dockyard. The barges are required because the harbor is too small for sea-going vessels to enter.

Infrastructure on the MLP is described in Section 2.1.1.

3.6.9 Water Resources

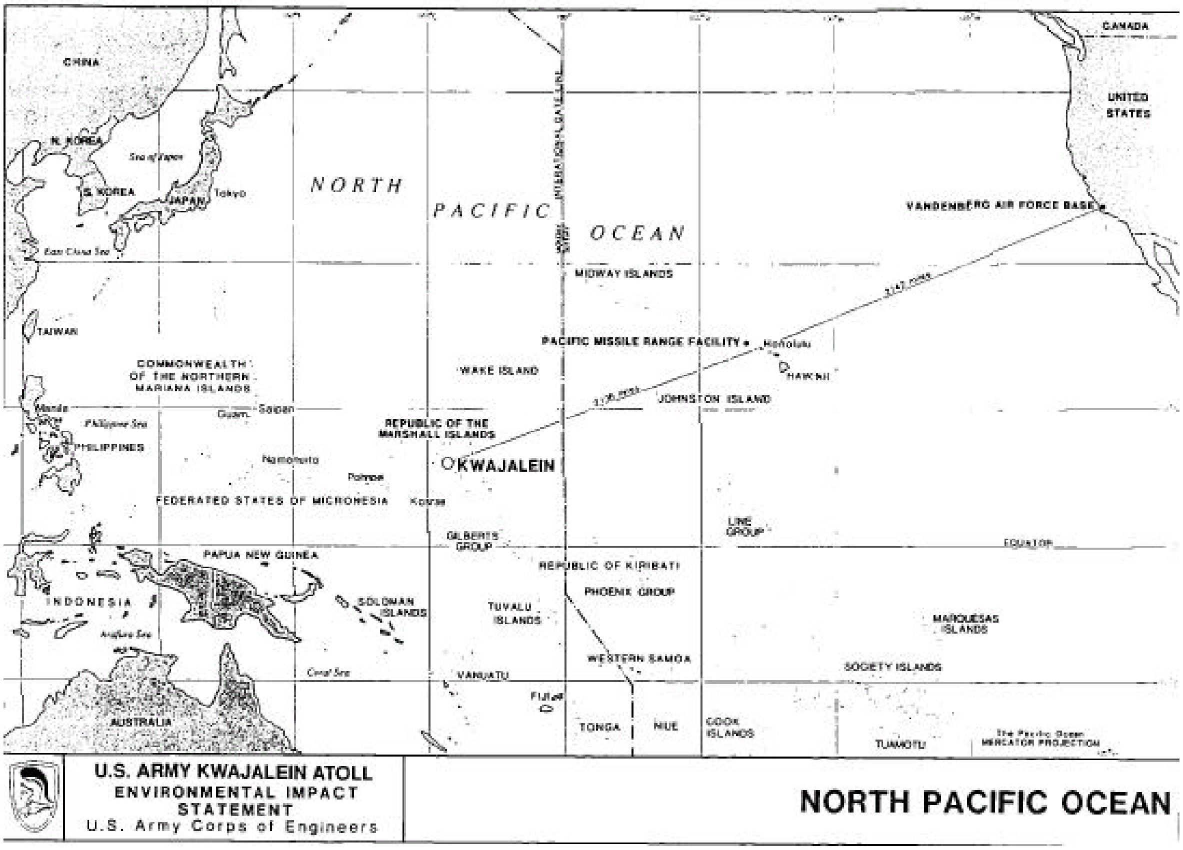
The prevailing trade winds cause strong currents to enter the Kwajalein lagoon and passes. The currents are a major source of sea water exchanging with lagoon water, and they help to keep the lagoon relatively well mixed. Water quality in the near shore and lagoon waters around USAKA and Wake Island is generally of very high quality, with high dissolved oxygen and pH at levels typical of mid-oceanic conditions. The waters in the region are well mixed and are not affected by nearby large landmasses and continents. In this area, the Pacific Ocean is deep, and its waters are considered pollution-free, pristine, and transparent.

3.7 Broad Ocean Area

The proposed use of the MLP in the BOA would take place at a distance of several hundred kilometers from any landmass. Assuming the MLP would be several hundred kilometers from any major landmass, the ROI would consist of the deep-water marine environment surrounding the MLP at the time of the test event. The near shore environment will not be considered because the MLP would not be near any landmass during test events in the BOA. For the purpose of this analysis, open ocean refers to those ocean areas beyond U.S. territorial limits as described for each launch alternative. Open ocean areas are subject to E. O. 12114, *Environment Effects Abroad of Major Federal Actions*. The E.O. 12114 specifically defines environment as "the natural and physical environment, and excludes social, economic and other environment;" therefore, potential impacts to environments other than the natural and physical environment are not analyzed in this assessment.

The Pacific Ocean covers nearly one third of the globe, 156 million square kilometers (60 million square miles). In comparison, the land area of the continental U.S., Alaska, and Hawaii covers less than four million square miles; the Pacific Ocean is more than 15 times the size of the U.S. The Pacific Ocean includes the Bali Sea, Bering Sea, Bering Strait, Coral Sea, East China Sea, Flores Sea, Gulf of Alaska, Gulf of Tonkin, Java Sea, Philippine Sea, Savu Sea, Sea of Japan, Sea of Okhotsk, South China Sea, Tasman Sea, Timor Sea, and other tributary water bodies. Its maximum length is 14,500 kilometers (9,000 miles) and its greatest width is 17,700 kilometers (11,000 miles), which lies between the Isthmus of Panama and the Malay Peninsula. (Encyclopedia.com, 2003) Figure 3-7 shows the BOA in relation to various islands in the Pacific Ocean.

Figure 3-7. Map of Pacific Ocean and Islands



Source: U.S. Army Strategic Defense Command, 1989

3.7.1 Air Quality

Winds and currents in the Pacific flow predominantly from east to west. Above the equator, Pacific Ocean trade winds blow from the northeast. Below the equator they blow from the southeast. Across the equatorial Pacific, prevailing trade winds push warm surface waters westward from Ecuador toward Indonesia. Deep, cold waters off the coast of South America rise, creating an east-west temperature contrast. That, in turn, lowers air pressure in the west, which draws in winds from the east.

Tropical cyclones (hurricanes) may form south of Mexico from June to October and affect Mexico and Central America. (Oceans of the World.com, 2003) Weather patterns in the north Pacific Ocean can be influenced by landmasses. The western Pacific tends to have a rainy season that occurs during the summer months, when moisture-laden winds blow from the ocean over the land, and a dry season that occurs during the winter months, when dry winds blow from the Asian landmass back to the ocean. Tropical cyclones (typhoons) may strike southeast and east Asia from May to December. (Oceans of the World.com, 2003)

No sources of ambient air quality monitoring data are known to exist for the Pacific Ocean BOA. Air quality over the Pacific Ocean is expected to be good because there are no major sources of air pollution, and the potential for dispersion of air pollutants should be good. There are no known emission inventories for the BOA of the Pacific Ocean.

3.7.2 Airspace

The airspace over the BOA is international airspace; and therefore, the procedures of the ICAO are followed. ICAO Document 4444 is the equivalent air traffic control manual to FAA Handbook 7110.65, Air Traffic Control. The FAA acts as the U.S. agent for aeronautical information to the ICAO. The Honolulu or Oakland ARTCCs manage air traffic in the ROI. The Oakland Oceanic Flight Information Region is the world's largest, covering approximately 18.7 million square miles (48.4 million square kilometers) and handling over 560 flights per day.

High-altitude overseas jet routes cross the Pacific BOA via nine Control Area Extension (CAE) corridors off the California coast. These corridors and associated jet routes continue northwest to Alaska and then southwest to Asia. These corridors can be opened or closed at the request of a user in coordination with the FAA. A Military Operations Area exists between users and the FAA to stipulate the conditions under which the CAEs can be closed to civil traffic. Under most circumstances, at least one CAE must remain available for use by general aviation and commercial air carriers.

3.7.3 Biological Resources

The general composition of the ocean includes water, sodium chloride, dissolved gases, minerals, and nutrients. These characteristics determine and direct the interactions between the sea water and its inhabitants. The most important physical and chemical properties are salinity, density, temperature, pH, and dissolved gases. For marine waters, the salinity is approximately 35 parts of salt per 1,000 parts of seawater.

Most organisms have a distinct range of temperatures in which they may thrive. A greater number of species live within the moderate temperature zones, with fewer species tolerant of extremes in temperature. Most areas of the Pacific maintain a temperature of 4°C (39.2°F). Surface sea water often has a pH between 8.1 and 8.3 (slightly basic), but generally is very stable with a neutral pH.

Organisms inhabiting the open ocean typically do not come near land, continental shelves, or the seabed. (Waller, 1996) Open ocean communities are composed of plankton and nekton, and make up approximately two percent of the marine species population. (Hickman, Roberts and Hickman, 1990) The plankton consists of plant-like organisms and animals that drift with the ocean currents, and nekton consists of animals that can swim freely in the ocean, such as fish, squid, and marine mammals. Benthic communities are made up of marine organisms, such as kelp, sea grass, clams, and other species that live on or near the sea floor. The deep-sea benthic community, which is a thousand to several thousand meters beneath open ocean waters, has been stable over long periods of geologic time and has allowed for the evolution of numerous highly specialized species. (Thorne-Miller and Catena, 1991) Less than one percent of benthic species live in the deep ocean below 2,000 meters (6,562 feet).

Threatened and Endangered Species

Species identified as threatened or endangered that exist in the BOA include the Northern right whale, Sei whale, Blue whale, Fin whale, Humpback whale, Sperm whale, Hawaiian monk seal, Loggerhead sea turtle, Green sea turtle, Leatherback sea turtle, Hawksbill turtle, and Olive ridley sea turtle (see Table 3-10).

Table 3-10. Federally Listed Threatened and Endangered Species in the BOA

Common Name	Scientific Name	Federal Status
Northern right whale	*Balaena glacialis*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
Humpback whale	*Megaptera novaengliae*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered

Source: adapted from U.S. Army Space and Missile Defense Command, 2002c

The **Northern right whale** (*Balaena glacialis*) is found in the Atlantic and Pacific oceans. Right whales were hunted almost to extinction. It is unlikely that these whales would be observed in the BOA.

For a description of Northern Right, Sei, Blue, Fin, Humpback, and Sperm whales please refer to Section 3.5.3.

3.7.4 Geology and Soils

The Pacific Ocean floor is characterized by the Central Pacific Trough, which extends from the Aleutian Islands southward to Antarctica and from Japan to the west coast of North America. The basin floors are not completely flat and ridges and seamounts abound. Along with a number of deep ocean trenches, the Pacific has many flat-topped seamounts called guyots. These are rarely found in other oceans. (Oceans of the World.com, 2003)

The lithosphere in the equatorial Pacific region is broken up into roughly two-dozen plates, which create various features on the ocean floor, such as ridges, trenches, and volcanoes. (DOT, 2001) The floor of the Pacific Ocean, which has an average depth of 4,300 meters (14,000 feet), is largely a deep-sea plain. The greatest known depth is the

Challenger Deep in the Marianas Trench, which is 10,911.5 meters (35,798.6 feet) deep. Rising from the plain are swells (many of which are volcanic), seamounts, and guyots. (Encyclopedia.com, 2003)

Ocean sediments include terrigenous, pelagic, and authigenic deposits. Terrigenous deposits consist of sand, mud, and rock particles formed by erosion, weathering, and volcanic activity on land and then washed to sea. These materials are largely found on the continental shelves and are thickest off the mouths of large rivers or desert coasts. Pelagic deposits, which contain the remains of organisms that sink to the ocean floor, include red clays and Globigerina, pteropod, and siliceous oozes. Covering most of the ocean floor and ranging in thickness from 60 meters (200 feet) to 3,300 meters (10,900 feet), pelagic deposits are thickest in the convergence belts and in the zones of upwelling. Authigenic deposits, which are materials that grow in place with a rock, rather than having been transported and deposited, consist of such materials as manganese nodules and occur in locations where sedimentation proceeds slowly or currents sort the deposits. (Wikipedia.com, 2003)

3.7.5 Hazardous Materials and Hazardous Waste

Test event sponsors would be responsible for safe storage and handling of the materials that they obtain and must adhere to all DOT hazardous materials transportation regulations see 49 CFR. Refer to Section 3.4.5 for additional information on hazardous materials and hazardous waste management for test events using the MLP.

3.7.6 Health and Safety

The affected health and safety environment for the BOA is described in terms of the appropriate range control procedures and verification of BOA clearance procedures. All activities would comply with DoD Directive 4540.1, *Use of Airspace by U.S. Military Aircrafts and Firing Over the High Seas* (January 13, 1981), which specifies procedures for conducting aircraft operations and for missile/projectile firing.

The U.S. Coast Guard Pacific Area Districts 11 (California), 14 (Hawaii) and 17 (Alaska) serve the Pacific Ocean ROI. Warning Areas are established in international airspace and waters to contain activity that may be hazardous and to alert pilots and captains of non-participating vessels to the potential danger. NOTAMs and NOTMARs would be published and circulated in accordance with established procedures to provide warning to pilots and mariners (including recreational users of the space) that outline any potential impact areas that should be avoided.

The WorldWide Navigational Warning Service is a worldwide radio and satellite broadcast system for the dissemination of Maritime Safety Information to U.S. Navy and merchant ships. The WorldWide Navigational Warning Service provides timely and accurate long range and coastal warning messages promoting the safety of life and property at sea and Special Warnings that inform mariners of potential political or military hazards that may affect safety of U.S. shipping. The world is divided into 16 Navigational Areas (NAVAREAs) for global dissemination of Maritime Safety Information. The National Imagery and Mapping Agency is the coordinator of NAVAREAs.

3.7.7 Noise

Baseline or ambient noise levels on the ocean surface are a function of local and regional wind speeds. Studies of ambient noise from the ocean have found that the sea surface is the predominant source of noise, and that the source is associated with the breaking of waves. (Knudsen, et al., 1948) Wave breaking can be further correlated to wind speed, resulting in a relationship between noise level and wind speed. (Cato, et al., 1994)

The primary man-made noise sources within the BOA are expected to be associated with ship and vessel traffic. These sources may include transiting commercial tankers and container ships, commercial fishing boats, and military surface vessels and aircraft. Vessel noise is primarily associated with propeller and propulsion machinery.

Noise sources associated with the MLP would include the tug vessel for the MLP and the two 750 kilowatt diesel generators on the MLP. Generators on the MLP could have peak noise levels of 96 dBA and attenuate to 80 to 89 dBA 15 meters (50 feet) from the source. The MLP personnel who remain on-board during missile launches would be required to wear appropriate hearing protection equipment during launches.

3.7.8 Transportation and Infrastructure

The major potential transportation issue related to use of the MLP is marine shipping. Marine shipping refers to the conveyance of freight, commodities, and passengers via mercantile vessels. The northern Pacific is an important commercial seaway, carrying a substantial portion of the U.S. trade in raw materials and finished products. In 1996, about 21 percent of all commercial vessels importing and exporting goods to and from the U.S. top 30 ports departed from, or were bound for, ports on the U.S. Pacific seaboard. The vast majority of these vessels crossed the northern Pacific Ocean, to and from the large trading ports of Asia.

There are no regulations or directions forcing commercial vessels to use specific cross-ocean lanes. Once it has left the navigation lanes leading out to open sea, the majority of shipping will use the shortest distance between two ports.

Infrastructure on the MLP is described in Section 2.1.1.

3.7.9 Water Resources

Water quality in the open ocean is considered excellent, with high water clarity, low concentrations of suspended matter, dissolved oxygen concentrations at or near saturation, and low concentrations of contaminants such as trace metals and hydrocarbons. The salinity of sea water is approximately 35 parts of salt per 1,000 parts of seawater. (UCAR, 2003a)

The density of pure water is 1,000 kilogram per cubic meter. Ocean water is denser, about 1,027 kilogram per cubic meter at the sea surface, because it contains salt. Temperature and salinity are the two main factors that determine the density of ocean water. Ocean water gets denser as temperature decreases and as salinity increases. (UCAR, 2003b)

Surface sea water often has a pH between 8.1 and 8.3 (slightly basic), but generally is stable with a neutral pH. The amount of oxygen present in sea water will vary with the rate of production by plants, consumption by animals and plants, bacterial decomposition, and surface interactions with the atmosphere.

The surface water currents in the Pacific Ocean influence the temperature of the water and the types of species that live in the region. Figure 3-8 shows the surface currents in the world's oceans. In the graphic, the red lines represent the movement of warm water, and the blue lines represent the movement of cold water.

Figure 3-8. Surface Currents of the World's Oceans

Source: (UCAR, 2003c)

3.8 Home Port

The State of California granted about 1,469 hectares (3,629 acres) of tidal and submerged lands to the U.S. for the establishment of a Naval Base at Mare Island. These grants were issued in 1854, 1897, and 1963. By the terms of these grants, title to the property reverts to the State of California when the U.S. no longer occupies the ceded lands for military purposes, as in the case of the 1854 statute, or no longer continues to hold and own the adjacent lands, as in the case of both the 1897 and 1963 statutes. In July 1993, the BRAC Commission recommended that the installation be closed. The installation was closed on April 1, 1996. A Record of Decision for the transfer of the Mare Island Naval Shipyard to the City of Vallejo was published on November 5, 1998.

Most of the Shipyard is situated on Mare Island, which lies to the west of the Napa River and Mare Island Strait into which the river flows. The island is about 5.6 kilometers (3.5 miles) long and is just west of the City of Vallejo, with its axis running approximately northwest to southeast. According to the 2000 Census, the City of Vallejo has a population of 116,760. The eastern half of Mare Island is developed with about 960 buildings that contain about 975,482 square meters (10.5 million square feet) of space. The eastern portion of Mare Island is dedicated to industrial land uses, and much of the land is being redeveloped. The western half of Mare Island is composed largely of wetlands, dredge material, disposal ponds, and submerged lands and is adjacent to San Pablo Bay. The southern end of Mare Island touches Carquinez Strait.

Activities at the Home Port could include loading of materials necessary to support the maintenance of the MLP and the crew while at sea and other support equipment. Loading these materials is an activity that is routinely conducted at Mare Island and therefore, is not analyzed in this document.

If the MLP is used as a platform for testing sensors, it may be possible to load the sensors at the home port location. It may be necessary to test the sensors (by radiating the sensor) on the MLP while the ship is at the home port location before traveling to the test location. This type of test will be considered in this analysis. Specific resource areas that may be impacted by this type of test would include: air quality, airspace, biological resources, health and safety, and land use. Impacts to other resource areas from testing the sensors at the home port are not applicable and will not be analyzed in this assessment.

3.9 Ordnance Loading Locations

The MLP, when used for missile launches, would not load ordnance at Mare Island because of safety restrictions. A limited number of ports are equipped and authorized to handle ordnance. The proposed ordnance loading locations for the MLP include the following ports

- Concord Army Terminal, California;
- Port of Oakland/U.S. Navy Fleet and Industrial Supply Center, California;
- U.S. Naval Weapons Station, Seal Beach, California; and
- U.S. Naval Station, Pearl Harbor, Hawaii.

Any of these locations could be used as the integration site for the non-pre-fueled liquid propellant missile. The propellants and missile would be loaded on the MLP at the ordnance loading location. Prior to the initiation of the action, standard operating procedures, including those for health and safety, would be developed to address fueling of missiles on the MLP while docked at the ordnance loading location.

Missiles would be loaded on the MLP fueled or unfueled, and prepared for ocean transport. Target and interceptor missile boosters, payloads, and support equipment would be transported by air, ship, or over-the-road common carrier truck from U.S. Government storage depots or contractor facilities to the ordnance loading ports. All shipping would be conducted in accordance with DOT-approved procedures and routing as well as OSHA requirements, U.S. Army safety regulations, and U.S. Air Force regulations. Appropriate safety measures would be followed during transportation of the propellants as required by the DOT and as described in 49 CFR 171-180, *Hazardous Materials Regulations of the Department of Transportation*. Existing standard operating procedures, including DOT regulations and applicable service regulations, would be modified if necessary and implemented.

For ship or barge transportation, U.S. Coast Guard and/or applicable U.S. Army transportation safety regulations would also be followed. Appropriate safety measures would be followed during loading of missiles and propellants as required by DoD and as described in DoD 6055.9-STD, *DoD Ammunition and Explosives Safety Standards.*

Missiles would not be shipped with initiators or other explosive devices. Applicable safety regulations would be followed in the transport, receipt, storage, and handling of hazardous materials. Depending upon the particular ordnance, U.S. Coast Guard and/or other security personnel would escort the ship at least until it departs the port. Some missile systems/ordnance may require armed guards throughout the deployment. Ordnance would be handled in accordance with DoD Explosives Safety Board standards, such as DoD Directive 6055.9, DoD Explosives Safety Board, and DoD Component Explosives Safety Responsibility, July 29, 1996.

No unusual, adverse impacts are expected at any of the ordnance loading locations. Similar operations routinely occur at each of these facilities. Therefore, these locations will not be considered further in this analysis.

4. ENVIRONMENTAL CONSEQUENCES

This Section describes the potential environmental consequences of the proposed action and alternatives by comparing these activities with the potentially affected environments. Sections 4.1 through 4.4 provide discussions of the potential environmental consequences of implementing the proposed action and alternatives for each of the resource areas considered. The amount of detail presented in each section is proportional to the potential for impacts. Section 4.5 discusses calibration of radars on the MLP at the home port location. Section 4.6 discusses specific analyses for the specific test scenarios identified in Section 2.3. The potential impacts of the No Action Alternative are discussed in Section 4.8. Sections 4.9 and 4.10 discuss the impacts of Alternative 1 and Alternative 2. Sections 4.11 and 4.12 discuss adverse environmental effects that cannot be avoided and irreversible or irretrievable commitment of resources, respectively.

To assess the potential for and relative significance of environmental impacts from the proposed action and alternatives, a description of the activities associated with each was provided in Section 2.0, and the environmental setting was described in Section 3.0. Program activities were then assessed in each environment to determine the potential impacts of implementing the proposed action and alternatives.

Activities associated with the proposed action would result in a potential for impacts similar to or less than those discussed in prior NEPA analyses listed in Section 1.5. The results of analyses provided in these documents are summarized as applicable in the following paragraphs and are incorporated by reference.

As discussed in Section 2.1.4, activities associated with missile launches include: pre-launch, launch, and post-launch activities. All of these activities have the potential for environmental impact and will be discussed in detail in this analysis. As discussed in Section 2.1.7, activities associated with testing sensors include: pre-operational, operational, and post-operational activities. Pre-operational activities involve coordination and movement of equipment on the MLP. Environmental impacts associated with equipment transfer of sensors would be the same as transfer of other equipment and supplies on ships, which are considered routine operations at ports. Post-operational activities include ensuring that the equipment is secure for transport to the home port and unloading sensor equipment. Environmental impacts associated with post-operational activities would be the same as other maintenance and unloading conducted on ships and at the home port location. Therefore, only the environmental impacts associated with sensor operational activities will be considered in detail in this analysis.

4.1 Western Range

4.1.1 Air Quality Impacts

4.1.1.1 Missile Test Events

Pre-launch Activities Impacts

Pre-Fueled Liquid Propellant Missile. The impact to air quality from pre-launch activities would be minimal. Because the missile is a single-stage prepackaged liquid propellant rocket, no missile-fueling operations would occur in the Western Range.

Non-Pre-Fueled Liquid Propellant Missile. Meteorological conditions would impact how quickly airborne pollutants associated with fuel transfer releases or spills would be dispersed. Fueling procedures developed for this proposed action would specify any meteorological conditions during which fueling would not be permitted. Therefore, it is not anticipated that normal fueling operations would impact air quality. It is unlikely that a propellant release larger than that described in Section 2.1.4 would occur on the MLP. However, if such an accidental release were to occur, it would most likely occur during fueling. A reasonable scenario would involve failure of the transfer equipment or valves. An analysis provided in the U.S. Army Space and Missile Defense Command Liquid Propellant Targets EA (2002), assumes a leak contained over a three-minute period would release up to 17 liters (4.5 gallons) of oxidizer (IRFNA or N_2O_4), hydrogen peroxide, or hydrazine. Analysis in that EA conducted using the U.S. Air Force Toxic Corridor Model indicated potential exceedances of health standards. These exceedances are discussed in Section 4.1.6.1 Health and Safety of Missile Test Events and in Table 4-2.

Solid Propellant Missile. Solid rocket motors would be manufactured and integrated into the missile at the time of manufacture. No missile-fueling operations would occur in the Western Range and thus no impacts to air quality from pre-launch activities would be expected.

Launch Activities Impacts

If the two 750-kilowatt generators used to provide electricity to operate ship systems on the MLP did not have sufficient power to support the launch of missiles, it would be necessary to use supplemental generators. These generators would be operated in accordance with all applicable regulations. Some studies have shown that diesel generators can produce 11 to 14 kilograms (25 to 30 pounds) of NO_x per megawatt hour of electricity generated and 0.5 to 1 kilogram (one to three pounds) of PM_{10} per megawatt-hour of electricity generated. (Santa Barbara County Air Control District, 2003) However, these generators would operate on an as-needed basis and would not be expected to significantly impact air quality.

The proposed activities would not bring any new stationary emission sources to the Western Range; therefore, new permits or changes to existing air permits would not be required.

Pre-Fueled Liquid Propellant Missile. The only hazardous air pollutants produced from launches of these missiles would be approximately 0.05 kilograms (0.10 pounds) of hydrochloric acid per launch from the solid propellant initiator. (U.S. Department of the Air Force, 1997a) A maximum of four launches per year would produce approximately 0.18 kilograms (0.40 pounds) of hydrochloric acid, which is much less than the CAA regulatory reporting requirement of 9 metric tons (10 tons) per year.

Previous analyses have considered the impacts of launching up to 16 pre-fueled liquid propellant missiles per year from land-based locations in the Western Range. In these analyses, the maximum annual level of emissions was approximately 0.16 metric tons (0.18 tons) of volatile organic compounds (VOCs) and 0.12 metric tons (0.13 tons) of NO_x. (U.S. Department of the Air Force, 1997a) The resulting emissions were found to be less than the de minimis levels (91 metric tons per year [100 tons per year]). The launch of up to four pre-fueled liquid propellant missiles, as part of the proposed action, would be part of the total annual launches conducted at the Western Range and therefore, would not further impact air quality.

Non-Pre-Fueled Liquid Propellant Missile. The primary exhaust products of non-pre-fueled liquid propellant missiles are carbon monoxide, carbon dioxide, hydrogen, nitrogen, and water. Earlier analyses determined that approximately 2.7 metric tons (3 tons) of reactive organic gases and 1.8 metric tons (2 tons) of NO_x would be emitted as a result of 30 missile launches (solid and liquid) per year, including mobile source and launch emissions. (U.S. Department of the Air Force, 1997b) Federal de minimis annual limits for reactive organic gases and NO_x are 45 metric tons (50 tons). The Santa Barbara County Air Pollution Control District emission budgets for on-road mobile source reactive organic gases and NO_x are 15.8 metric tons (1 7.42 tons) and 20 metric tons (22.07 tons) per day, respectively. Analysis provided in the Theater Ballistic Missile Targets EA determined that five target missile launches in one day would result in 0.070 metric tons (0.078 tons) of reactive organic gases and 0.102 metric tons (0.112 tons) of NO_x, which would be well within the permissible limits. Furthermore, there would be a maximum of only four launches per year, therefore these estimates are greater than would expected from four annual launches from the MLP. The impacts for non-pre-fueled liquid propellant missiles, using UDMH and IRFNA, would be similar to those for pre-fueled liquid propellant missiles. However, there would be no emissions such as hydrogen chloride (HCl) and aluminum oxide (Al_2O_3) that are associated with the solid propellant gas generator.

Solid Propellant Missile. The primary exhaust products of solid propellant missiles are HCl, carbon monoxide, NO_x, and Al_2O_3. Hydrogen chloride, carbon monoxide and NO_x

emissions are in the form of gases and Al_2O_3 is emitted as particulate. Gaseous HCl combines with water in the atmosphere to create hydrochloric acid aerosol. Hydrochloric acid could have an impact on the sea water near the launch location. However, sea water is slightly alkaline, with a pH of around 8 and any hydrochloric acid that did reach the ocean would be quickly neutralized. (U.S. Army Space and Strategic Defense Command, 1994b) Carbon monoxide and NO_x emissions are further oxidized to carbon dioxide and nitrogen dioxide due to the high temperatures in the launch engine exhaust.

Post-launch Activities Impacts

Debris produced during a launch would be disposed of in accordance with applicable regulations, including the International Convention for the Prevention of Pollution, or brought to the home port for disposal.

Northwesterly surface winds in the open ocean areas of the Western Range or westerly winds in near shore areas would disperse any small emission amounts resulting from transporting the MLP from the test event location.

Pre-Fueled Liquid Propellant Missile. The toxic corridor resulting from accident scenarios involving UDMH and IRFNA would vary with wind velocity. Analyses in the Final EIS for the Program Definition and Risk Reduction Phase of the Airborne Laser Program (1997) showed the toxic corridor could be as large as 890 by 160 meters (2,920 by 525 feet) for a wind velocity of five meters per second (11 miles per hour), and only 45 by 24 meters (150 by 80 feet) for a wind velocity of one meter per second (2.2 miles per hour).

Non-Pre-Fueled Liquid Propellant Missile. The impacts from post-launch activities would be as described above.

Solid Propellant Missile. The impacts from post-launch activities would be as described above. Solid propellant would likely continue to burn until expended if encased; however if released from the motor casing, it is possible that solid propellant would not burn completely. This would have a minor and transient impact on air quality.

4.1.1.2 Air Quality Impacts from Sensor Test Events

Operational Activities Impacts

Operational emissions from the MLP would be limited to the exhaust produced by generators and maintenance activities. Two 750-kilowatt (a total of 1,500-kilowatt) generators were installed on the MLP to provide electricity to operate ship systems and various types of equipment. If appropriate, these generators also would be used to power sensors.

Some sensor systems would require additional generators to power the sensor during calibration and test events. The largest generator required for sensors proposed for use on the MLP would be for the TPS-X (1.1–megawatt generator); therefore, it is the worst-case example that will be used for this analysis. In the worst-case scenario, it is assumed that all three generators would operate at full-power 24 hours per day during the entire duration of the test events. Therefore, the maximum number of hours for a 21-day test event would be 504 hours. For up to four tests per year, generators on the MLP would run up to 2,016 hours per year.

The U.S. Army Space and Missile Defense Command (2003b) analyzed the impacts to air quality of a 1,650-kilowatt diesel generator and a 1.5-megawatt diesel generator. Table 4-1 outlines the emissions from up to 2,016 hours per year of generator use.

Table 4-1. Generator Emissions (2,016 hours per year)

	NO_X metric tons (tons) per year	HCl metric tons (tons) per year	Carbon Monoxide metric tons (tons) per year	PM_{10} metric tons (tons) per year
1,650 kilowatt Diesel Generator	30.60 (33.66)	4.32 (4.75)	37.92 (41.71)	1.80 (1.98)
1.5 megawatt Diesel Generator	27.82 (30.6)	3.93 (4.32)	34.47 (37.92)	1.63 (1.79)
Total	54.42 (64.26)	8.25 (9.07)	72.39 (79.63)	3.43 (3.77)

The total emissions listed in Table 4-1 are below the de minimis thresholds and would not exceed the National Ambient Air Quality Standards in the Western Range. The total actual kilowatt usage on the MLP for three generators would be less than the kilowatt usage examined in the U.S. Army Space and Missile Defense Command (2003b), as outlined in Table 4-1. Therefore, emissions from generator use would be lower than those found in Table 4-1 and would not adversely impact air quality. Because the MLP would not be considered a stationary source, neither a Prevention of Significant Deterioration review nor a Title V permit would be required.

Any emissions resulting from generator operations would be quickly dispersed in the open ocean areas due to northwesterly surface winds and in the near shore environment due to westerly coastal winds. Emissions from the sensor system would not be expected to adversely affect the near shore areas of southern California. Much of the corresponding onshore area near the Western Range is designated an unclassified/attainment area and has low levels of pollutants.

4.1.2 Airspace Impacts

4.1.2.1 Missile Test Events

Pre-launch Activities Impacts

Launch preparations involving the open ocean areas of the Western Range would follow standard evacuation procedures of the active warning area. Establishing a restricted area would marginally reduce the amount of navigable airspace, but because the airspace is not heavily used, the impacts to controlled and uncontrolled airspace would be minimal. The airways and jet routes that traverse the ocean area airspace in the Western Range could be affected by the proposed action. However, missile launches would be conducted in compliance with DoD Directive 4540.1 that specifies procedures for conducting missile and projectile firing, namely "firing areas shall be selected so that trajectories are clear of established oceanic air routes or areas of known surface or air activity" and in coordination with the FAA. No significant impacts to over-water airways and jet routes would be expected. Therefore, launch preparation activities for any of the missiles under consideration would not have adverse impacts on airspace.

Launch Activities Impacts

The area affected by launch activities would be the Western Range and the West Coast Offshore Operating Area (WCOOA) complex of restricted airspace and warning areas. The WCOOA airspace is west of the coastline and extends seaward approximately 370 kilometers (200 nautical miles). All missile launches would take place in existing restricted airspace or warning areas. Restricted airspace and the special use airspace of the WCOOA are designed to accommodate necessary military activity and to protect other users from hazardous operations. Missile-launch operations within the Western Range would affect airways and jet routes that traverse the area. Airspace would be evacuated within the launch hazard areas and commercial flights would be rerouted to and from the Los Angeles Basin. Use of the Western Range for the missile launch site would impact five control airways (Control 1155, 1176, 1177, 1316, and 1318) and depending on the direction of the missile launch, warning areas W-289, W-289N, W-290, W-537, W-532, W-412, W-61, or W-60.

Post-launch Activities

Missile intercepts and missile debris would occur within special use airspace areas. No post-launch impacts are expected to occur from the release of restricted airspaces and warning areas to normal non-hazardous use. Therefore, no impacts to regional airspace would be expected from post-launch activities for any of the missiles under consideration.

4.1.2.2 Sensor Test Events

Operational Activities Impacts

Airspace restrictions would be short-term events and would not pose a significant impact on available airspace in the Western Range. Sufficient notice of restricted areas would be provided to allow pilots to select alternate flight paths to avoid the restricted areas. Potential safety consequences associated with radar interference with electronic and emitter units (e.g., flight navigation systems, tracking radars) would also be examined before startup.

Radar. A high-energy radiation area notice would be published on the appropriate aeronautical charts, notifying aircraft of a radio frequency radiation area. The boundaries of the radar high-energy radiation area would be configured to minimize impacts to aircraft operations and other potentially affected systems. Radar operations would be coordinated with FAA and range officials and would be scheduled to occur during hours of minimal aircraft operations if possible. The MLP would be located far enough off the coast of California that it would not be expected to interfere with any existing airfield or airport arrival and departure traffic flows.

Radars on the MLP would be programmed to limit radio frequency emissions in the direction of airways that pass within the potential interference distance. In addition, since the radar beam is in constant motion, it is highly unlikely that the MLP radars would illuminate an aircraft long enough to interfere with onboard electronics.

The FAA and DoD have standards for EMR interference with aircraft, which should not be exceeded. DoD uses MIL-STD-464 standards; to operate in the area, military aircraft would have to be hardened or protected from EMR levels up to 3,500 volts per meter (peak power) and 1,270 volts per meters (average power). Commercial aircraft must be hardened or protected from EMR levels up to 3,000 volts per meter (peak power) and 300 volts per meter (average power) as mandated by the FAA by Notice 8110.71, Guidelines for the Certification of Aircraft Flying through High Intensity Radiated Field Environments. Radars on the MLP would not exceed the 3,000 volts per meter power threshold.

Telemetry. The data acquisition and communications equipment on telemetry systems would not be expected to impact airspace in the Western Range.

Optical Systems. Measurements by the mobile optical systems would be accomplished non-intrusively with no impacts to airspace. Because these passive optical systems would be used for “watching” targets, similar to the operation of a camera, they would not cause significant interference in the airspace in the Western Range.

4.1.3 Biological Resources Impacts

4.1.3.1 Missile Test Events

Pre-launch Activities Impacts

The low speed of the MLP during transport activities would keep it from colliding with marine mammals; therefore, there would be no impacts to biological resources from transporting the MLP to the proposed test event location.

Use of spill prevention, containment, and control measures would prevent or minimize impacts to biological resources from spills of propellants.

Standard range warning procedures would include surveys for large concentrations of marine mammals in the launch, overflight, and impact areas. If marine mammals are sighted, the Flight Safety Officer would determine whether to continue on schedule, delay the test event, or postpone it until a future date.

Pre-Fueled Liquid Propellant Missile. Because no fueling operations would take place in the Western Range, no impacts would be expected to biological resources from fueling operations.

Non-Pre-Fueled Liquid Propellant Missile. Although a leak of any component from the propellant storage containers during fueling would be highly improbable, approved spill containment would ensure any accidental leakage does not enter the water and affect marine species.

Solid Propellant Missile. No impacts from pre-launch activities would be expected.

Launch Activities Impacts

Currently over 25 missiles per year are launched from the Western Range; the DoD has coordinated with NOAA Fisheries to obtain the appropriate authorizations for the incidental take of marine mammals because of launch activities in the Western Range. The launches of missiles conducted from the MLP in the Western Range would be part of the total annual launches addressed in the authorization from NOAA Fisheries.

Marine mammals may experience both auditory and non-auditory effects from noise produced during launches. Potential auditory effects include behavioral disturbance (including displacement), acoustic masking (elevated noise levels that drown out other noise), and (with very loud sounds) temporary or permanent hearing impairment. Noise from missile launches in the Western Range is most likely to cause startle responses in wildlife. The disturbance of harbor seals, other pinnipeds, and shore birds that populate the coast near Vandenberg Air Force Base, has been analyzed in many studies of space launch vehicles in past decades (e.g., Space Shuttle, Titan IV, Lockheed Launch Vehicle, Atlas II, Taurus, Delta), and requests for "Incidental Harassment and Take Permits" have been submitted. Because the proposed missiles are smaller than the space launch vehicles currently launched at the Western Range and because launches from the MLP would take place in the open ocean, the potential disturbance to the indigenous populations is expected to be less than existing impacts.

The noise level thresholds of impact to marine life in general and marine mammals in particular are currently the subject of scientific study. Because different species of marine mammals have varying sensitivity to different sound frequencies and the species may be found at different locations and depths, it is difficult to generalize sound impacts to marine mammals from missile impacts in the ocean areas. Should consensus emerge from the scientific analysis about the effects of underwater noise upon marine mammals, it would then be possible to predict the consequences of a particular sonic boom contour on marine mammals in the area.

According to analysis provided in the U.S. Navy's Point Mugu Sea Range EIS/OverseasEIS (2002), brief transient sounds such as sonic booms are unlikely to result in significant adverse effects to pinnipeds in the water. Pinnipeds seem tolerant of noise pulses from sonic booms, although reactions may occur. Temporary displacement, less than one or two days, is considered a less than significant impact. Momentary startle or alert reactions in response to a single transient sound such as a sonic boom are not considered to have a significant adverse effect on whales. Baleen whales (humpback, gray, and bowhead) have often been observed behaving normally in the presence of loud noises such as distant explosions. Most gray and bowhead whales show some avoidance of areas where these noises have pressures exceeding 170 dB. (U.S. Department of the Navy, 2002 as cited in U.S. Army Space and Missile Defense Command, 2003a)

Potential non-acoustic effects to biological resources include physical impact by falling debris, entanglement in debris, and contact with or ingestion of debris or hazardous materials. Potential adverse effects could occur from sonic boom overpressures, shock wave impact, ingestion of toxic solutions generated from the unburned propellant mixed with seawater, and ingestion of pieces of unburned propellant.

The impact of the missiles with the ocean surface would impart a considerable amount of kinetic energy to ocean water upon impact. Missiles would hit the water surface with speeds of 91 to 914 meters (300 to 3,000 feet) per second. It is assumed that the shock wave from their impact would be similar to that produced by explosives. Depending on the water depth, strong waves from the impact may detach kelp strands from the sea floor. At close ranges, injuries to marine mammal internal organs and tissues could result. However, as the distance from the shore increases, the density of marine species, including marine mammals, generally decreases and the corresponding probability of impact from activities associated with the proposed action decreases. Injury to any marine mammal by direct impact or shock wave impact would be extremely remote (less than 0.0006 marine mammals exposed per year). (U.S. Department of the Navy, 2002) The splashdown of the missiles would be planned to occur at considerable distances from land and in water thousands of meters deep.

Pre-Fueled Liquid Propellant Missile. Pollutants would be present in the exhaust plume from missiles launched from the MLP in the Western Range. However, these pollutants would be produced in trace quantities and would not have measurable effects on biological resources.

At the time of an intercept, a pre-fueled liquid propellant missile would have less than 80 kilograms (180 pounds) of propellant onboard at an altitude of more than 15 kilometers (50,000 feet). The remaining propellant onboard would be vaporized and quickly mixed with the surrounding air during the destruction of the missile. Therefore, it would have no measurable effect on the aquatic ecosystem of the Western Range.

Non-Pre-Fueled Liquid Propellant Missile. Only a small amount of hydrochloric acid, as outlined in Section 4.1.1.1, would be emitted near the MLP and would have no impact on biological resources.

During a test event not involving an intercept, a non-pre-fueled liquid propellant missile would have approximately 265 liters (70 gallons) of fuel and 473 liters (125 gallons) of oxidizer remaining when it impacts the ocean at an established impact location. The propellants would likely be deposited in the ocean. The release of IRFNA or N_2O_4 could result in limited emission of nitric acid. The reaction of the acid with sea water would initially increase water temperature and lower the pH in the local area which has the potential to impact marine organisms in the area of the release. Hydrogen peroxide released to the ocean would decompose into water and oxygen within several hours and therefore, would be unlikely to impact marine organisms. Kerosene or JP-8 fuel that reached the ocean surface would quickly spread on the surface from the effects of gravity, wind, and waves. Kerosene or JP-8 fuel can be toxic to marine organisms and would likely affect plankton on the ocean surface. Overall plankton mortality, however, would be small relative to the size of the ocean and because plankton populations are naturally discontinuous and concentrated below the surface. (Murray, James W. and Richard T. Barber, Michael R. Roman, Michael Bacon, and Richard A. Freely, 1994, 2001) Releases of hypergolic fuels such as hydrazine, MMH, or UDMH, would be diluted in water. The concentration of hydrazine that is lethal for half the number of fish in a population exposed for one to four days ranges from 0.54 to 5.98 milligrams/liter. These fuels also are toxic to plants in both water and air. Two and one half parts sea water to one part fuel is required to dilute hydrazine below its toxic threshold. Given the volume of water in the ocean, any release of these fuels would likely be diluted and would have minimal impact on biological resources.

Solid Propellant Missile. Solid rocket motors emit HCl vapor and Al_2O_3 particles, which are known to harm plants and wildlife. Birds passing through the exhaust plume may be exposed to levels of HCl that would irritate their eyes and respiratory systems. Studies indicate that low-level, short-term exposure to HCl does not cause significant health impacts in animals and birds. Al_2O_3 has a very low toxic potential. HCl and Al_2O_3 do not bioaccumulate; and therefore, no effects on the food chain would be expected. (FAA 1996, as cited in U.S. Army Space and Strategic Defense Command, 2002c)

Post-launch Activities Impacts

Debris impact and booster drops in the Western Range could occur within the Exclusive Economic Zone of San Nicolas Island and California. The natural buffering capacity of sea water and the strong ocean currents would neutralize the reaction to any release of propellants. Analysis in the Marine Mammal Technical Report, prepared in support of the Final EIS/Overseas EIS, Point Mugu Sea Range (U.S. Department of the Navy, 2002 as cited in U.S. Army Space and Missile Defense Command, 2003a), determined that there is a very low probability that a marine mammal would be killed by falling missile boosters, targets, or debris as a result of tests at the Point Mugu Sea Range (less than 0.0149 marine mammals exposed per year). The potential for an object or objects dropping from the air to affect marine mammals or other biological resources is less than 10×10^{-6} (one in one million).

The impact of the early stage boosters (if used) or the missiles themselves in the case of an unsuccessful intercept is planned to occur in open ocean waters thousands of meters deep at considerable distance from the nearest land mass. At these depths remaining parts of the missiles would sink to the ocean floor and would be located away from feeding marine mammals. (Pacific Missile Range Facility, 1998 as cited in U.S. Army Space and Missile Defense Command, 2003a)

Pre-Fueled and Non-Pre-Fueled Liquid Propellant Missiles. The impacts from post-launch activities would be as described in the previous paragraphs.

Solid Propellant Missile. Because of the slow rate at which the toxic materials dissolve out of the solid fuel matrix, the concentration and toxicity of dissolved solid rocket motor fuel in the ocean, from the unexpended rocket motor, or portions of it, is expected to be negligible and without any substantial effect.

The parts of solid rocket motor propellant expelled from a destroyed or exploded rocket motor that fall into the ocean would most likely sink to the ocean floor at depths of thousands of meters. At such depths, the propellant parts would be located away from feeding marine mammals.

4.1.3.2 Sensor Test Events

Operational Activities Impacts

Because operational activities for sensors would take place in the open ocean, there would be no impacts to near shore vegetation. There would be no loss of habitat in the near shore environment. There would be no adverse impacts on Essential Fish Habitat located in the Western Range.

Potential impacts on wildlife in the near shore environment could result from seabirds and shorebirds, including migratory species, striking the antennas, telescopes and shelters or becoming disoriented due to high intensity lighting at night. Threatened and endangered birds, such as the Western snowy plover, California brown pelican, and California least tern, may be affected. To minimize the occurrence of bird strikes, antennas would be raised only as necessary and have colorful streamers to increase visibility to birds. Because telescopes would not be raised to heights greater than a few feet, the occurrence of bird strikes would be infrequent. To reduce the likelihood that birds might become disoriented, high intensity lighting would be used only when necessary during test events and low intensity lighting would be used whenever possible. Lighting would be adequate for safe working conditions but minimized to the extent practical.

Because use of sensors would occur onboard the MLP, marine wildlife found in the ocean would not be affected. In the event that a diesel fuel spill occurred during operational activities, biological resources could be affected. However, the probability that a spill would occur is low. Any spills would be remediated in accordance with pollution prevention and spill prevention plans to minimize impacts to biological resources found in marine waters.

Radar. No EMR impacts to wildlife would be expected; the power densities emitted from the radar would be unlikely to cause any biological effects in animals or birds. Radars on the MLP would not be expected to radiate lower than five degrees above horizontal, which would preclude EMR impacts to surface species during test events. The radar main beam would not be directed toward the ocean surface, which limits the probability of energy absorption by surface-oriented wildlife.

The power density level just below the surface of the ocean where marine mammals may be located would not exceed the permissible exposure level for uncontrolled environments. (U.S. Department of the Navy, 2002a as referenced in U.S. Army Space and Missile Defense Command, 2003b) No adverse impacts would occur to whales, other marine mammals, or sea turtles found at least 1.3 centimeters (0.5 inch) below the surface. It is also highly unlikely that an individual would be on or substantially above the surface of the water for a significant amount of time within the main beam areas during radar operation. Therefore, no impacts are anticipated to Humpback whales, other marine mammals, or sea turtles that might be present in the vicinity of the home port, transit, and test event locations.

The potential for main-beam exposure thermal effects to birds exists. The *Final Ground-Based Radar Family of Radars EA* (U.S Army Program Executive Office, 1993) analyzed potential impacts to wildlife from EMR. The main beam would normally be in motion, making it extremely unlikely that a bird would remain within the most intense area of the beam for any considerable length of time. The size of the beam is relatively small, which further reduces the probability of bird species remaining within this limited region of space, even if the beam remained still. (Ballistic Missile Defense Organization, 2000, as cited in U.S. Army Space and Missile Defense Command, 2003b)

Potential impacts from EMR from the X-band radars to wildlife have been compared to the existing Cobra Dane radar operating on Eareckson Air Station on Shemya Island, Alaska. The Cobra Dane operates in the L-band, and the TPS-X operates in the X-band. The X-band has less potential to cause thermal heating in biological resources than the L-band. Like the Cobra Dane, the TPS-X main beam would be constantly moving and would not be stationary over one area. The USFWS has not noticed die-offs of birds below the Cobra Dane radar. (Martin, 1999 as referenced in U.S. Army Space and Missile Defense Command, 2003b) Overall, no impacts to birds would be expected from the operation of radars, telemetry or optical sensors on board the MLP.

4.1.4 Geology and Soils Impacts

4.1.4.1 Missile Test Events

Pre-launch Activities Impacts

Establishment of restricted areas and conducting evacuations of offshore oil-production platforms would have no impact to geology and soils. Evacuation or sheltering of offshore oil-production platforms could lead to a temporary shutdown in well production. However, there would be no impact on petroleum reserves. There would be no impact to geology from the temporary relocation of personnel.

Pre-Fueled Liquid and Solid Propellant Missiles. No impacts from pre-launch activities would be expected.

Non-Pre-Fueled Liquid Propellant Missile. In the unlikely event that a spill of propellants occurred during fueling operations, no impacts to geology and soils would be expected because the propellants would not be expected to reach the sea floor, where they would impact geology and soils.

Launch Activities Impacts

No impacts to geology and soils would be expected from the launch of any of the types of missiles from the MLP due to the depth of the ocean in areas where the MLP would operate. Inert pieces of debris would consist of aluminum, steel, graphite composite, plastic, ceramic, and rubber. These materials would likely sink to the ocean floor; however, they would be unlikely to impact geology and soils in the open ocean area.

Post-launch Activities Impacts

In the event of a failed mission scenario, the resulting debris would be the same as described above for launch activities impacts for all types of missiles.

4.1.4.2 Sensor Test Events

Operational Activities Impacts

The operation of sensors from the MLP would not result in temporary evacuations of oil-production platforms and therefore would not result in a shutdown in well production. Radars on the MLP would be directed so that personnel on offshore oil-production platforms would not be impacted by EMR. Therefore, no impacts to geology and soils in the Western Range would be expected from the use of sensors on the MLP.

4.1.5 Hazardous Materials and Hazardous Waste Management Impacts

4.1.5.1 Missile Test Events

Pre-launch Activities Impacts

Limited quantities of hazardous waste may be generated by pre-launch activities. These may include unused or contaminated cleaning solvents, unused lubricants or hydraulic fluids. All pre-launch operations (e.g., handling of explosives or hazardous materials) would be conducted in accordance with established procedures.

Missile assembly activities at the ordnance loading port could generate limited quantities of hazardous waste, similar to those identified above. These wastes are typical of those generated on-board ships at these locations.

The quantity of hazardous materials used and hazardous waste generated is not expected to significantly impact the generator status or current hazardous materials management and waste disposal practices of the ordnance loading ports.

Pre-Fueled Liquid Propellant Missile. Pre-fueled liquid propellant missiles would not require fueling and therefore there would be no handling of hazardous propellants at the ordnance loading port.

Non-Pre-Fueled Liquid Propellant Missile. Applicable regulations and operating procedures would be followed when handling propellants. The oxidizers IRFNA and N_2O_4 are hazardous and corrosive materials and would require special handling procedures during fueling onboard the MLP. Waste disposal requirements would also be similar for these oxidizers. In addition, hydrazine fuels and the initiator fuel are very hazardous and would have more stringent handling requirements than kerosene/coal tar distillate and JP-8 fuels. Waste disposal requirements are similar for all of the fuels.

The kerosene-based and JP-8 fuels are less volatile than the oxidizer, and there would be negligible amounts of fuel vapors released to the atmosphere. Hydrazine fuels would be similar to the oxidizers in volatility and vapors released. These releases would have no health and safety impacts beyond the immediate transfer area. Personnel directly involved in transfer operations would be equipped with appropriate personal protection equipment as per the operating procedures developed.

Flushing the fuel transfer system after fueling would generate approximately 208 liters (55 gallons) of ethyl alcohol with approximately 40 grams (1.4 ounces) of fuel in solution. (U.S. Army Space and Missile Defense Command, 2002b) Flushing the oxidizer transfer system with deionized water would generate neutralized deionized water and oxidizer rinsate and would result in the release of approximately five grams (0.2 ounce) of nitric oxide to the atmosphere. (U.S. Army Space and Missile Defense Command, 2002b) This quantity would not cause safety or health impacts. The material generated from flushing the propellant transfer systems would be handled as hazardous waste and would be disposed of via permitted procedures at appropriate disposal facilities. Although propellant quantities and fueling systems have not been defined for all non-pre-fueled liquid propellant missiles, it is anticipated that they would be similar. N_2O_4 oxidizer would also involve similar flushing methods and materials generated as the IRFNA.

Solid Propellant Missile. Solid propellant is a Class 1.3 explosive material. Solid propellant would be transported using the existing infrastructure, and in accordance with existing procedures as are used for similar types of explosives. Solid propellants would be stored in facilities that are approved for explosive storage.

Launch Activities Impacts

Hazardous materials carried aboard missiles may include solid propellants, liquid propellants, and working fluids (hydraulic fluids, lubricants, fuel for the generators, and solvents). The National Aeronautics and Space Administration (NASA) has conducted evaluations of the effects of missile systems that are deposited in sea waters. The studies determined that materials would be rapidly diluted, and except for areas in the immediate vicinity of the debris, would not be found at concentrations identified as causing any adverse effects. This applies to debris deposited either as a result of successful or unsuccessful intercepts, or due to in-flight malfunction or flight termination along the flight corridor. Eventually, all hazardous materials falling into the ocean would be diluted by the water and would cease to be of concern. NASA determined that the release of hazardous materials aboard missiles into sea water would not be significant. (National Aeronautics and Space Administration, 1973 as cited in U.S. Army Space and Missile Defense Command, 2003a) Therefore, no significant impacts would be expected from launch activities involving pre- and non-pre-fueled liquid propellant missiles.

<u>Solid Propellant Missile.</u> During nominal missile flights, all solid propellant would be expended. Debris would include structural material (beryllium) and batteries. Flight termination or catastrophic missile failure would result in the deposition of hazardous waste materials, including batteries, beryllium, and any unburned solid propellant; however, the deposition of these materials would have no significant impacts.

Post-launch Activities Impacts

The U.S. Navy requires that, to the maximum extent practicable, ships shall retain hazardous waste onboard for shore disposal. If hazardous materials are discharged overboard, this must occur more than 370 kilometers (200 nautical miles) from land. Discharging hazardous materials overboard is not standard practice and would only be done in emergency situations. Twenty-five liquid discharges, such as clean ballast, deck runoff, and dirty ballast, from normal operation of military vessels are required to be controlled by installation of control technologies or use of management practices (marine pollution control devices) under the UNDS provisions of the Clean Water Act. In compliance with UNDS, the MLP would incorporate marine pollution control devices, such as keeping decks clear of debris, cleaning spills and residues, and engaging in spill and pollution prevention practices, in design or routine operation.

Missile debris, including debris that contains potentially hazardous waste, would most likely sink to the ocean floor at depths of thousands of meters. It is not anticipated that missile debris would be recovered from the deep-sea water, and thus, there would be no collection of hazardous waste and no impacts associated with hazardous waste management activities from post-launch activities involving pre- and non-pre-fueled liquid propellant missiles.

<u>Solid Propellant Missile.</u> During flight termination, pieces of unburned propellant could be dispersed over an ocean area of up to several square kilometers. Once in the water, ammonium perchlorate could slowly leach out and would be toxic to plants and animals. The impact of perchlorate on water quality is discussed in Section 4.1.9.1.

4.1.5.2 Sensor Test Events

Operational Activities Impacts

All hazardous materials used and hazardous waste generated during operational activities would be handled in accordance with applicable Federal, state, and local regulations. Although not normally considered hazardous waste (designation varies by state), used petroleum, oil, and lubricants may be generated in small amounts. The fuel would be disposed of as used (non-hazardous) petroleum, oil, and lubricants. Generator engine oil changes would likewise result in generation of small amounts of used motor oil.

Temporary storage tanks and other facilities for the storage of hazardous materials would be located in protected and controlled areas designed to comply with spill prevention and countermeasure plans. Hazardous wastes generated during operational activities may consist of materials such as waste oils, hydraulic fluids, cleaning fluids, cutting fluids, and waste antifreeze. The minimal quantities of hazardous waste that could potentially be generated would be containerized and returned and disposed of in accordance with appropriate waste disposal regulations.

Any spill of a hazardous material or hazardous waste would be quickly remediated in accordance with applicable spill prevention, countermeasure, and control plans.

Therefore, the impacts from radar, telemetry, and optical sensor operations onboard the MLP would be insignificant.

4.1.6 Health and Safety Impacts

4.1.6.1 Missile Test Events

Pre-launch Activities Impacts

Tests would be conducted in areas that would minimize the impacts to marine transportation and thus, the health and safety of individuals aboard other vessels. Workers from offshore oil production platforms may be evacuated or sheltered to minimize impacts to health and safety. Continued monitoring of testing areas for other marine vessels would take place to ensure such areas remain clear. Health and safety operating procedures would be developed and implemented for missile fueling onboard the MLP. Consequently, no adverse impacts to public health and safety would be expected from pre-launch activities for any missiles on the MLP.

Launch Activities Impacts

Potential safety hazards associated with launch operations from the MLP would include inhalation of exhaust products, missile drop zones, missile intercepts, and intercept debris. Because launch activities from the MLP would not take place close to any landmass, members of the public would not be exposed to these hazards.

Appropriate health and safety operating procedures would be developed to protect personnel during test events. These procedures would address evacuation requirements and launch mishaps. Every reasonable precaution would be taken during the planning and execution of the test activities to prevent injury to life or property. The MLP contains a hardened deck to protect personnel during launches. Each test range conducts missile flight safety reviews, which include analysis of missile performance capabilities and limitations, hazards inherent in missile operations and destruct systems, and the electronic characteristics of missiles and instrumentation. It also includes computation and review of missile trajectories and hazard area dimensions, review and approval of destruct systems proposals, and preparation of Range Safety Approval and Range Safety Operational Plans required of all programs.

As stated in Section 4.1.1.1, analysis conducted using the U.S. Air Force Toxic Corridor Model indicated potential exceedances of health standards as shown in Table 4-2. Actual hazard distances would depend on the type and amount of propellant released, meteorological conditions, and emergency response measures taken. Standard operating procedures would be developed and would include personal protection equipment, procedures and safe distances for fueling operations (based on information similar to that provided in Table 4-2). The low likelihood of such a release and the implementation of approved emergency response plans would limit the potential for impact to air quality.

For missions in the Western Range, the possibility of debris impacting a vessel would be remote, and therefore safety impacts of flight termination would not be significant. Therefore, the impacts from launch of any missiles from the MLP would be insignificant.

Post-Launch Activities Impacts

Post-launch activities would not be expected to pose any impact to health and safety from pre- and non-pre-fueled liquid and solid propellant missiles.

Table 4-2. Potential Exceedances Due to Accidental Oxidizer or Fuel Leak during Fueling

Propellant	Health Standard	Standard Limit	Exceedance Distance[e]
IRFNA	OSHA Permissible Exposure Limit (PEL)[a]	2 parts per million (5 milligrams per cubic meter)	34 meters (112 feet)
	National Institute for Occupational Safety and Health (NIOSH) Short Term Exposure Limit (STEL)[b]	4 parts per million (10 milligrams per cubic meter)	20 meters (66 feet)
	Immediately Dangerous to Life and Health (IDLH)[c]	25 parts per million (65.5 milligrams per cubic meter)	Not Exceeded
Hydrogen Peroxide	OSHA PEL	1 parts per million (1.4 milligrams per cubic meter)	212 meters (696 feet)
	NIOSH STEL	1 parts per million (1.4 milligrams per cubic meter)	212 meters (696 feet)
	IDLH	75 parts per million (105 milligrams per cubic meter)	14 meters (46 feet)
N_2O_4	American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV)[d]	3 parts per million (5.4 milligrams per cubic meter)	310 meters (1,017 feet)
	ACGIH STEL[b]	5 parts per million (9 milligrams per cubic meter)	227 meters (746 feet)
	IDLH	75 parts per million (135 milligrams per cubic meter)	103 meters (336 feet)
Hydrazine	OSHA PEL	1 parts per million (1.31 milligrams per cubic meter)	117 meters (383 feet)
	ACGIH STEL	0.1 parts per million (0.131 milligrams per cubic meter)	36 meters (118 feet)
	IDLH	50 parts per million (65.5 milligrams per cubic meter)	Not Exceeded

Source: National Institute for Occupational Safety and Health, 2002a, b, c; MG Industries, 2002, Toxnet, 2002, adapted from U.S. Army Space and Missile Defense Command, 2002b

Notes:

a The OSHA PEL is the level of exposure that must not be exceeded when the exposure is averaged over an 8-hour workday and a 40-hour workweek in the workplace.

b The NIOSH STEL (or OSHA STEL or ACGIH STEL) is the level of exposure that must not be exceeded at any time during a workday when the exposure is averaged over 15 minutes.

c The IDLH is the level of exposure (not time-weighted) above which it is anticipated a person would suffer life-threatening or irreversible health effects or other injuries that would impair them from escaping the hazardous environment.

d The ACGIH TLV is an average value of exposure over the course of an 8-hour work shift.

e Exceedance Distance—Average of U.S. Air Force Toxic Corridor model results for 15-minute and 30-minute averaging time and multiple stability classes.

4.1.6.2 Sensor Test Events

Operational Activities Impacts

Prior to each mission, personnel would determine shielding requirements to minimize potential sources of interference between sensors and communications equipment. Appropriate "keep out" zones would be identified and equipment would be placed on the MLP in locations that would avoid interference to the extent practical.

<u>Radar.</u> An EMR/electromagnetic interference survey would be conducted that considers Hazards of Electromagnetic Radiation to Personnel (HERP), Hazards of Electromagnetic Radiation to Fuels (HERF), and Hazards of Electromagnetic Radiation to Ordnance (HERO). The analysis would provide recommendations for sector blanking and safety systems to minimize exposures. The proposed systems would have appropriate safety exclusion zones established before operation, and warning lights to inform personnel when the system is in operation and emitting EMR.

EMR hazard zones would be established within the beam's tracking space and near emitter equipment. A visual survey of the area would be conducted to verify that all personnel are outside the hazard zone prior to startup. Personnel may not enter these hazard zones while the radar is in operation. Potential safety consequences associated with radar interference with other electronic and emitter units (flight navigation systems, tracking radars, etc.) would also be examined prior to startup.

Non-frequency-related interference from sensor systems would be limited to high-power effects. High-power effects typically occur in receivers that are located in proximity to high power transmitters and may be the result of either antenna-coupled signals or equipment case penetration. The accepted levels for high power effects are 1 megawatt per square centimeter for military equipment and 0.1 megawatt per square centimeter for civilian equipment. Under the proposed sensor operating conditions, full power operation would involve tracking an object in space with the beam pointed up and constantly moving. The beam would not remain stationary for any appreciable period of time; thus, the odds of interference from high power effects with any electronic equipment on the ground would be slight.

Implementation of Range operational safety procedures, including establishment of controlled areas and limitations in the areas subject to illumination by the radar units, would preclude any potential safety hazard to either the public or workforce from exposure to EMR. Radar operations on the MLP would be coordinated with the FAA, U.S. Coast Guard, and other groups or agencies as appropriate.

Potential health and safety hazards associated with the operation of radars were analyzed in two previous documents: *Ground-Based Radar Family of Radars EA* (U.S. Army

Program Executive Office, 1993) and *EA for Theater Missile Defense Ground-Based Radar Testing Program at Fort Devens, Massachusetts.* (U.S. Army Space and Strategic Defense Command, 1994a) The analyses considered both program operational requirements and restrictions and range-required safety procedures. It was determined that the required implementation of operational safety procedures, including establishment of controlled areas and limitations in the areas subject to illumination by the radar units, would preclude any potential safety hazard to either the public or workforce from exposure to EMR.

The analysis method used to evaluate potential effects of radio frequency radiation is the Institute of Electrical and Electronics Engineers (IEEE) Maximum Permissible Exposure Limits (MPELs), which define the maximum time-averaged radio frequency power density allowed for uncontrolled human exposure. The MPEL method is independent of body size or tissue density being exposed. EMR hazard zones provide a safety factor 10 times greater than the MPEL. MPELs are capped at 5 megawatt per square centimeter for frequencies greater than 1,500 megahertz. (Radio Frequency Electromagnetic Fields to IEEE, 1999) General public exposure is typically limited to one fifth of the occupational limits.

At X-band frequencies, the IEEE standard for human exposure is 5.33 megawatt per square centimeter to 8 megawatt per square centimeter. In order for radars to have an effect on human health, the beam operating at full power would have to come in contact with a person and remain focused on them for 7.5 minutes (at 8,000 megahertz) or 11.25 minutes (at 12,000 megahertz). With the implementation of software controls, there would be no radiation hazard area on the deck of the MLP.

<u>Telemetry.</u> Radio frequency emissions associated with communications equipment are considered to be of sufficiently low power so that there is no exposure hazard. Because operation of the telemetry equipment on the MLP would occur during test events in the open ocean, only personnel located onboard the MLP would be exposed. Operation of telemetry systems would not present a significant health and safety hazard.

In the event of an emergency scenario, telemetry systems would be used to activate the FTS on a missile. A command-destruct onboard transmitter would be located with the telemetry equipment and have both directional and omni-directional antennas. It would operate on ultra high frequency bandwidth at approximately 420 megahertz. The transmitter would be activated manually when the flight path of the missile deviates from established parameters. Upon activation, the transmitter would send arm and destruct tones to the missile to trigger an explosive sequence or thrust termination to terminate flight. Transmission of the arm and destruct signals would be active and would be similar to operation of radars on the MLP. The discussion of the health and safety impacts of radars would also apply to the use of telemetry systems. The probability that the FTS would be activated is low, and impacts to health and safety as a result of activation of the command-destruct transmitter would not be anticipated.

Optical Systems. Measurements by the mobile optical systems would be accomplished non-intrusively with no impacts on health and safety. Because operation of the mobile optical systems on the MLP would occur during test events in the ocean, only personnel located onboard the MLP would be exposed. The optical instrumentation would include a variety of telescopes and detectors ranging in wavelength from ultraviolet to the mid-band infrared, which includes the visible light spectrum. These passive optical systems would be used for "watching" targets much like a camera is used. As a result, operation of the mobile optical systems would not present a significant health and safety hazard.

4.1.7 Noise Impacts

4.1.7.1 Missile Test Events

Pre-launch Activities Impacts

Transportation of the MLP to the launch location would be similar to other marine vessel transportation activities in this region and would not be expected to pose an impact from noise. Other pre-launch activities, including preparing the missile for launch, would produce noises similar to other industrial activities on ships. Pre-launch activities would not be expected to pose a significant noise impact to the surrounding environment from any of the types of missiles under consideration.

Launch Activities Impacts

Noise impacts depend upon the sensitivity of the receptor to the sound generated. Receptors include workers, and any wildlife and the public in the proximity of the noise source or in the case of a launch in the path of a sonic boom. Worker safety related to noise exposure is addressed in OSHA 29 CFR 1910.95, Occupational Noise Exposure.. Launches would be relatively short events during which essential personnel would be located under the hardened deck of the MLP in an area protected from the noise generated during launch. Personnel located on the tow vessel would be moved to a safe distance and would be protected from the noise generated during launches. The potential exists for extended exposure to high noise levels from generators, and this type of noise may lead to possible noise impacts to operations personnel. Personnel that may be exposed to loud noises would be required to wear hearing protection, such as earplugs, earmuffs, or headphones, which would reduce the noise levels to acceptable levels.

Because the MLP would be in off shore areas, the public would not be affected by launch noise. Public safety would not be affected due to the lack of public access to the launch or impact areas. Since the launches would take place while the MLP is at sea, members of the public would not be located close to the launch and therefore would not be exposed to the maximum noise level (L_{max}) contour of 85 dB that would extend approximately 1,277 meters (4,190 feet) from the MLP.[7] Because relatively few launches would occur annually, they would not appreciably affect background noise levels. Therefore, no noise impacts would be expected from launches during test events from the MLP.

The missiles could generate a sonic boom. Each missile would propagate a unique sonic boom contour depending upon the mass, shape, velocity, and reentry angle, among other variables. The location of the possible impact point would vary depending upon the particular flight profile. These noise levels would be of very short duration.

Annoyance created by sonic booms is a function of boom intensity, number of booms per time period, attitude of the population, and the activity in which individuals were engaged at the time of the boom. There is no precise relationship between the parameters. A noise study found that 10 percent of subjects exposed to 10 to 15 booms per day were annoyed at an overpressure of one pound per square foot and that this reached nearly 100 percent at three pounds per square foot. (NASA, Environmental Impacts Statement for the Space Shuttle Program, April 1978 as cited in FAA, 1992) However, individuals may be more sensitive when exposed to numerous booms per day, while prior experience with sonic booms (such as individuals who live on an Air Force Base) seems to lower sensitivity. Other studies indicate that there is a wide scope for estimating the percent annoyed, which ranges from 10 to 70 percent at one pound per square foot and from 55 to approximately 100 percent at three pounds per square foot.

Noise impacts on marine animals are discussed in Section 4.1.3.1.

Pre-Fueled Liquid Propellant Missile. A peak sound-pressure level of 147 dB has been measured at a distance of 90 meters (295 feet) from a pre-fueled liquid propellant missile launch. Noise levels at one and 10 kilometers (0.6 and 6 miles) from the launch area would be approximately 125 and 90 dB, respectively. (U.S. Department of the Air Force, 1997a)

Sonic booms would occur approximately two seconds after the launch of the missile. The sonic boom of the missile would not affect the immediate area around the launch site (less than 500 meters [1,640 feet]). The sonic boom would have an intensity of approximately 145 dB and duration of less than 0.035 second. (U.S. Department of the Air Force, 1997a)

Non-Pre-Fueled Liquid and Solid Propellant Missiles. The impacts from launch activities would be as described in the paragraphs above.

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[7] The 85 dB contour is used because this is the accepted level required to administer a continuous effective hearing convservation program for employees exposed to an 8-hour time weighted noise level. (U.S. Army Space and Missile Defense Command, 2002b)

Post-launch Activities Impacts

Noise impact would result from the two 750-kilowatt generators on the MLP and any noise associated with the tow vessel. Because comparable marine vessels occur in the Western Range on a regular basis, no significant impact would be expected from this action. Noise impacts from post-launch operations, including washing down the deck of the MLP and other clean up and maintenance activities would not be expected to have an impact on noise levels. Noise from post-launch operations for any missile type would not be expected to have an impact on ambient noise levels.

4.1.7.2 Sensor Test Events

Operational Activities Impacts

Operation of the two 750-kilowatt generators on the MLP could be expected to have peak noise levels of 96 dBA and attenuate to 80 to 89 dBA at 15 meters (50 feet) from the source. (U.S. Army Space and Missile Defense Command, 2003b) Noise from the generators may temporarily cause marine wildlife located within close vicinity of the MLP to avoid the area until the MLP has passed; however, adverse impacts are not anticipated. Operation of radar, telemetry, and optical sensors would not result in significant noise levels. The backup generator that may be used to power sensors would be located in a self-contained trailer with a noise-dampening shroud that would minimize the potential for diesel generator noise.

4.1.8 Transportation and Infrastructure Impacts

4.1.8.1 Missile Test Events

Pre-launch Activities Impacts

The transportation of missiles and propellants to the ordnance loading port would not impact transportation. Because missile launches occur regularly in the area, and because ocean vessels are already notified of such events on a regular basis, the impact of missile launches on marine traffic would be negligible. The impacts to airspace from pre-launch activities are discussed in Section 4.1.2.1. Any disruption would be of short duration and would not be expected to have a significant impact on transportation.

Pre-Fueled Liquid and Solid Propellant Missiles. No impacts on transportation and infrastructure from pre-launch activities would be expected.

Non-Pre-Fueled Liquid Propellant Missile. Liquid propellants would be transported in DOT-approved containers. Appropriate safety measures would be followed during transportation of the propellants as required by DOT and as described in the Bureau of Explosives (BOE) Tariff No. BOE 6000-I, *Hazardous Materials Regulations of the*

Department of Transportation (Association of American Railroads, 2000. (Bureau of Explosives Tariff No. BOE 6000-I, *Hazardous Materials Regulations of the Department of Transportation*).

Launch Activities Impacts

Impacts to airspace are considered in Section 4.1.2.1. Issuance of NOTMARs is standard practice and would allow marine vessels to clear the affected area and as such launch activities would have no impact on marine transportation.

Studies have shown an average 189 liters (50 gallons) per capita per day water consumption and 170 liters (45 gallons) per capita per day of wastewater production. Studies indicated that in the U.S., the per capita generation of municipal solid waste in 1998 was 2 kilograms (4.46 pounds) per capita per day. (U.S. Environmental Protection Agency, Region 9, 2002; as referenced in U.S. Army Space and Missile Defense Command, 2003b) Average daily demand for water, wastewater, and municipal solid waste for a maximum of 100 personnel would be estimated as follows, based on typical usage: 18,900 liters (5,000 gallons) water; 17,000 liters (450 gallons) wastewater, and 200 kilograms (446 pounds) solid waste per day. The infrastructure on the MLP would be able to accommodate this level of use and, thus, there would be no impacts from launches of missiles from the MLP.

Post-launch Activities Impacts

Post-launch activities, including washing the deck and other clean up and maintenance activities, would not be expected to have an impact on transportation and infrastructure.

4.1.8.2 Sensor Test Events

Operational Activities Impacts

Because NOTAMs and NOTMARs would be issued in advance of test events, aircraft and commercial marine vessels would be able to choose transportation routes outside of the proposed test event areas. Impacts to infrastructure would be as discussed in Section 4.1.8.1 for launch activities. Therefore, there would be no impacts to transportation and infrastructure from the use of sensors on the MLP.

4.1.9 Water Resources Impacts

4.1.9.1 Missile Test Events

Pre-launch Activities Impacts

Towing the MLP would result in minor releases of diesel fuel to water from the tow vessel. This would occur for the transportation of all missile types. Because marine transportation occurs regularly in the region, however, impacts from proposed activities would have no significant impact.

Non-Pre-Fueled Liquid Propellant Missile. The release of liquid propellants during fueling could result in limited emission of nitric acid through release of IRFNA. The reaction of the acid with sea water would initially increase water temperature and lower the pH in the local area. However, the low levels of the emissions and the natural buffering capacity of the sea water combined with the strong ocean current would neutralize the reaction in a relatively short period of time.

Releases of hypergolic fuels, such as hydrazine, MMH, or UDMH, would be diluted in water. Hydrazine is infinitely soluble in water and may be flammable and explosive up to a concentration of 400 grams/liter (40%). (International Programme on Chemical Safety, 2003) Two and one half parts sea water to one part fuel are required to dilute hydrazine below its toxic threshold. Given the volume of water in the ocean and depth at which fueling operations would occur, releases of these fuels would be quickly diluted and would have no impact on water quality.

Hydrocarbon fuels such as kerosene and JP-8 that reached the ocean surface would quickly spread on the surface from the effects of gravity, wind, and waves. The majority of the fuel would evaporate from the ocean surface within a few hours, while the remainder would disperse in the water column and degrade. Therefore, releases of these fuels would have little, if any, impact on water quality.

Launch Activities Impacts

Impacts from hazardous materials to water resources are as discussed in Section 4.1.5.1. No adverse impacts are expected due to the high buffering capability of ocean water in the Western Range.

Pre-Fueled and Non-Pre-Fueled Liquid Propellant Missiles. Exhaust emissions may contain hydrogen chloride and hydrogen fluoride vaporthat could reach the ocean as the acid forms if rainfall occurred within two hours of a launch, but the acid would be neutralized by calcium carbonate in ocean water. Therefore exhaust emissions from liquid propellant missile launches would not impact water quality.

Successful intercepts would result in the release of small quantities of UDMH fuel and IRFNA oxidizer at altitudes over 12,192 meters (40,000 feet) above MSL. At the time of destruction less than 10 percent of the fuel would remain. It is anticipated that the majority of the unspent missile propellant would be dispersed in the atmosphere during flight termination, with an insignificant concentration reaching the ocean surface. Therefore impacts to ocean water quality from UDMH and IRFNA would not be expected.

Solid Propellant Missile. Al_2O_3 would be hazardous only in acidic environments (pH<5) where it would dissolve into free aluminum cation. (FAA, 1996, as cited in U.S. Army Space and Missile Defense Command, 2003b) Rain within two hours of a launch could cause HCl to be deposited as acid rain. Analyses for the most conservative case, where rain would be present soon after the test event, concluded that acid deposition to the surface water would not result in any impacts to large surface water bodies. This analysis was based on the buffering capacity of fresh water, which is considerably lower than the buffering capacity of sea water. Therefore, it is expected that even for the most conservative case, in which all of the HCl emissions fall over the open ocean, the pH level would not be depressed by more than 0.2 standard units for more than a few minutes. (Pacific Missile Range Facility, 1998 as cited in U.S. Army Space and Missile Defense Command, 2003a) Deposition of HCl into marine waters is not expected to significantly affect the pH of the water due to the small amount of HCl deposited and the buffering capacity of the water. Any Al_2O_3 or HCl deposited in the ocean would be quickly diluted.

During nominal launch events nearly all HCl and Al_2O_3 rocket motor emissions would be incorporated into the ground cloud and no significant amounts of emission products would be deposited.

Solid propellant does not dissolve in water. In freshwater at 20 ^{o}C (68 ^{o}F), it would likely take over a year for the perchlorate contained in the solid propellant to leach out into the water. (Lang, et al 2000, as cited in U.S. Army Space and Missile Defense Command, 2003b) Lower water temperatures or more saline water environments would likely prolong the time required for the perchlorate in the solid propellant to leach into the water. Over this time, the perchlorate would be diluted in the water and would not reach significant concentrations. (U.S. Army Space and Missile Defense Command, 2003b)

Post-launch Activities Impacts

If freshwater were used to wash the deck following a launch, there might be a temporary localized decrease in the salinity of the ocean water near the MLP; however, the amount of water required would be small compared to the volume of water in the open ocean area surrounding the MLP. No adverse impacts to water quality from post-launch activities involving pre- and non-pre-fueled liquid propellant missiles would be expected.

Solid Propellant Missile. It is expected that even in the most conservative scenario of an on-ship or early flight failure where all of the propellant is ignited and all of the HCl and Al_2O_3 are deposited within the hazard area, any toxic concentration of these products would be buffered and diluted by sea water to non-toxic levels within minutes. (U.S. Army Space and Strategic Defense Command, 1994b)

4.1.9.2 Sensor Test Events

Operational Activities Impacts

There is a potential for impact to water quality from a diesel spill due to operation of the generators; however, the potential for a spill is low. Any releases of hazardous materials into sea water would not be significant. Materials would be rapidly diluted and would not be found at concentrations identified as producing any adverse effects due to the high buffering capability of the ocean waters in the Western Range. The ocean depth in the vicinity of any sensor test event would be thousands of meters deep; consequently, any impact from the fuel would be minimal.

4.2 Pacific Missile Range Facility

4.2.1 Air Quality Impacts

4.2.1.1 Missile Test Events

Pre-launch Activities Impacts

The impacts from pre-launch activities for all missile types would not have a significant impact on air quality as described in Section 4.1.1.1.

Launch Activities Impacts

The proposed activities would not bring any new stationary emission sources to the PMRF area, therefore new permits or changes to existing air permits would not be required.

Emissions resulting from generator operations to support any of the missiles under consideration would be quickly dispersed in the near shore environment of the PMRF due to the prevailing northeasterly trade winds. Emissions from launches would be as described in Section 4.1.1.1, and would not be expected to adversely affect the near shore areas of Kauai or the other Hawaiian Islands. The State of Hawaii is in attainment for both National and State Ambient Air Quality Standards. Emissions from launch activities on the MLP would be similar to those produced by other launches at the PMRF.

Post-launch Activities Impacts

Transporting the MLP from test event locations in PMRF for any of the missiles under consideration would result in small amounts of localized vehicle emissions as described in Section 4.1.1.1, which would have a minor impact on air quality. The prevailing trade winds would disperse any small emission amounts.

4.2.1.2 Sensor Test Events

Operational Activities Impacts

Emissions from the use of generators to support sensors on the MLP for test events are discussed in Section 4.1.1.2. The use of a third generator to support test events involving sensor systems in conjunction with the two 750-kilowatt generators would result in fewer emissions than those listed in Table 4-2, and therefore, minimal impacts on air quality would be anticipated.

The impacts of emissions resulting from generator operations for radar, telemetry, and optical sensor test events in PMRF would be as described in Section 4.2.1.1.

4.2.2 Airspace Impacts

4.2.2.1 Missile Test Events

Pre-launch Activities Impacts

The special use airspace at the PMRF consists of restricted areas R-3101, which lies immediately above PMRF/Main Base and to the west of Kauai, and R-3107, which lies over Kaula, a small uninhabited rocky islet 35 kilometers (19 nautical miles) southwest of Niihau. The special use airspace also includes warning area W-188 north of Kauai, and warning area W-186 southwest of Kauai, all controlled by PMRF. Warning areas W-189 and W-190 north of Oahu and W-187 surrounding Kaula are scheduled through the Fleet Area Control and Surveillance Facility. The surrounding areas are located in international airspace; and therefore, the procedures of the ICAO are followed. The airspace in the ROI is managed by Oakland ARTCC in its Ocean Control-5 Sector.

Two IFR en route low altitude airways used by commercial air traffic pass through the airspace in the ROI, V-15, which passes east to west through the southernmost part of warning area W-188, and V-16, which passes east to west through the northern part of warning area W-186 and over Niihau. Missile launches are short-term, discrete events, which would not be expected to have a significant impact on airspace. Test event sponsors would ensure coordination with the ICAO through the FAA to issue NOTAMs, locate ships with radar capable of monitoring the airspace, contact all commercial airlines and civil and private airports, and monitor appropriate radio frequencies to minimize potential safety impacts. Therefore, no significant impacts to airspace from pre-launch activities would be expected from any type of missile launched from the MLP.

Launch Activities Impacts

Missiles would rapidly attain altitudes well above FL 600 and well above the airspace subject to Article 12 and Annex 11 of the ICAO Convention. Normal missile overflights would not affect either air traffic control or other aircraft using en route airspace. Consequently, no impacts to airspace use for PMRF are anticipated.

The MLP would be located far enough off the coast of Kauai that it is not expected to interfere with any existing airfield or airport arrival and departure traffic flows. Coordination with the Honolulu Combined Center Radar Approach control would occur to designate restricted areas and warning areas for test events. The airways and jet routes that crisscross the ocean area airspace ROI have the potential to be affected by the proposed action. However, missile launches would be conducted in coordination with the FAA and in compliance with DoD Directive 4540.1. Therefore, no significant impacts to the over-water airways and jet routes would be expected from any of the missiles proposed for launch from the MLP.

Post-launch Activities Impacts

No post-launch impacts are expected to occur concerning the release of restricted airspace and warning areas to normal non-hazardous use. Therefore, no impacts to regional airspace would be expected from post-launch activities related to any of the missiles under consideration for launch from the MLP.

4.2.2.2 Sensor Test Events

Operational Activities Impacts

The MLP would be located far enough off the coast of Kauai that it is not expected to interfere with any existing airfield or airport arrival and departure traffic flows. As discussed in Section 4.1.2.2 sufficient notice of restricted areas would be provided to allow pilots to select alternate flight paths to avoid the restricted areas. Coordination with the Honolulu Combined Center Radar Approach control would occur to designate restricted areas and warning areas for sensor test events in the PMRF.

4.2.3 Biological Resources Impacts

4.2.3.1 Missile Test Events

Pre-launch Activities Impacts

Transportation of the MLP from the ordnance loading location to the test event location in PMRF would occur on routes currently used for similar maneuvers and would meet applicable regulations.

As discussed in Section 4.1.3.1, if whales or dolphins are observed in pre-launch surveys of the near shore launch safety zone or launch hazard zone, the launch would be delayed until the area is cleared. These precautions would reduce the probability of debris impact on marine mammals.

Launch Activities Impacts

As the distance from the shore increases, the density of marine species, including marine mammals, generally decreases and the corresponding probability of impact from activities associated with the proposed action decreases. The potential for impact exists when missiles associated with the proposed action fall into the ocean where they could impact a marine species.

Of particular concern is the potential for impacts to marine mammals from both auditory and non-auditory effects, which are discussed in Section 4.1.3.1.

There would be no adverse impacts on coral reefs or special habitats located near the PMRF, such as the HIHWNMS, from launch operations.

Impacts to submerged barrier reefs may occur from the shock wave produced when a missile impacts the water. However, the splashdown of the missiles would be planned to occur at considerable distances from land and in water thousands of meters deep which would minimize the potential for the shock wave to adversely affect barrier reefs.

Post-launch Activities Impacts

Debris impact and booster drops near PMRF would be in the deep open ocean. The natural buffering capacity of sea water and the strong ocean currents would neutralize the reaction from any release of liquid propellants. Other post-launch activities associated with launch of missiles from the MLP, including washing down the deck, would not impact biological resources.

4.2.3.2 Sensor Test Events

Operational Activities Impacts

There would be no adverse impacts on coral reefs or special habitats located near the PMRF, such as the HIHWNMS, from sensor test event operations.

Threatened and endangered birds such as Newell's shearwater, dark-rumped petrel, Hawaiian (American) coot, and Hawaiian black-necked stilt may be affected by lighting used on the MLP and by the presence of antennas. To reduce the likelihood that birds, particularly the Newell's shearwater, would become disoriented by high intensity lighting on the MLP at night, high intensity lighting would only be used during test events and low intensity lighting would be used whenever possible. As discussed in Section 4.1.3.1, lighting would be properly shielded, following USFWS guidelines to minimize reflection and impact to birds.

4.2.4 Geology and Soils Impacts

4.2.4.1 Missile Test Events

Pre-launch Activities Impacts

Establishing restricted areas and conducting evacuations would have no impact on geology and soils.

Launch Activities Impacts

Launch activities would be conducted at some distance from land and no impacts to geology and soils, including reef areas around PMRF, would be expected from the launch of missiles from the MLP.

Post-launch Activities Impacts

Debris would likely sink to the ocean floor; however, it would be unlikely to impact geology and soils in the open ocean area.

4.2.4.2 Sensor Test Events

Operational Activities Impacts

Because operational activities for sensors would occur onboard the MLP, coral reefs, coastal sediment, and the sea floor in the open ocean and near shore areas of PMRF would not be affected. Therefore, no impacts to geology and soils would be expected from the use of sensors on the MLP.

4.2.5 Hazardous Materials and Hazardous Waste Management Impacts

4.2.5.1 Missile Test Events

Pre-launch Activities Impacts

Hazardous materials and waste that may be used and generated by pre-launch activities are discussed in Section 4.1.5.1. No impacts from pre-launch activities would be anticipated.

Launch Activities Impacts

NASA has conducted evaluations of the effects of missile systems that are deposited in sea waters and determined that they pose an insignificant impact. This discussion can be found in Section 4.1.5.1.

Post-launch Activities Impacts

Post-launch activities would comply with U.S. Navy requirements for discharge of hazardous waste and the UNDS provisions of the Clean Water Act, which are discussed in Section 4.1.5.1.

Missile debris would most likely sink to the ocean floor at depths of thousands of meters. It is not anticipated that missile debris would be recovered from deep sea waters and thus there would be no collection of hazardous waste and no impacts related to hazardous waste management activities.

4.2.5.2 Sensor Test Events

Operational Activities Impacts

All hazardous materials used and hazardous waste generated during operational activities would be handled in accordance with applicable Federal, state, and local regulations, including PMRF and U.S. Navy standard operating procedures.

The impacts from operational activities would be similar to those described in Section 4.1.5.2, which discusses the handling of diesel fuel and used petroleum, oil, and lubricants; compliance with U.S. Navy requirements for discharge of hazardous waste and the UNDS provisions of the Clean Water Act; and spill prevention.

4.2.6 Health and Safety Impacts

4.2.6.1 Missile Test Events

Pre-launch Activities Impacts

Range Safety officials would ensure operational safety in the PMRF operational areas in the open ocean prior to a test event. The operational areas consist of warning areas W-186 and W-188 and restricted area R-3101. As described in Section 4.1.6.1, no impacts to health and safety would be expected from missile test events.

Launch Activities Impacts

Activities to ensure that health and safety precautions are taken during the planning and execution of test activities are discussed in Section 4.1.6.1.

For missions using PMRF, it is anticipated that the possibility of debris impacting a vessel would be remote, and therefore safety impacts of flight termination would not be significant for any category of missile under consideration.

Post-launch Activities Impacts

Post-launch activities would not be expected to impact health and safety.

4.2.6.2 Sensor Test Events

Operational Activities Impacts

Range Safety officials would ensure operational safety in warning areas W-186 and W-188 and restricted area R-3101. As discussed in Section 4.1.6.2, no impacts would be expected from sensor test events.

4.2.7 Noise Impacts

4.2.7.1 Missile Test Events

Pre-launch Activities Impacts

Pre-launch activities would be as discussed in Section 4.1.7.1 and would not be expected to pose a significant noise impact to the surrounding environment.

Launch Activities Impacts

Three possible issues that determine potential noise impacts, personnel safety, public safety, and public annoyance, are discussed in Section 4.1.7.1. No impacts would be expected.

Post-launch Activities Impacts

Post-launch activities would be as discussed in Section 4.1.7.1, and no impacts would be expected.

4.2.7.2 Sensor Test Events

Operational Activities Impacts

Operation of the two 750-kilowatt generators on the MLP could be expected to have peak noise levels of 96 dBA and attenuate to 80 to 89 dBA at 15 meters (50 feet) from the source, as discussed in Section 4.1.7.2. Sensor operations would not be expected to have significant noise impacts in the PMRF range.

4.2.8 Transportation and Infrastructure Impacts

4.2.8.1 Missile Test Events

Pre-launch Activities Impacts

Transportation of missiles and propellants to the ordnance loading location would be conducted via road, rail, or air transport, as discussed in Section 4.1.8.1.

Because missile launches occur regularly in the PMRF area, and because ocean vessels are already notified of such events as they are scheduled, the impact of missile launches from the MLP on marine traffic would be negligible. Any disruption would be of short duration and would not be expected to have a significant impact on transportation.

Launch Activities Impacts

Clearance of air traffic corridors that cross this region and ships or fishing boats observed in a designated impact area is discussed in Section 4.1.8.1. Launch activities involving all missiles under consideration within the PMRF range would not be expected to adversely impact commercial marine vessels that import and export raw materials and finished products to and from the U.S.

Post-launch Activities Impacts

Post-launch activities, including washing the deck and other cleanup and maintenance activities, would not be expected to have an impact on transportation and infrastructure.

4.2.8.2 Sensor Test Events

Operational Activities Impacts

A large portion of U.S. trade in raw materials and finishing products is carried through the northern Pacific Ocean to the large trading ports of Asia. NOTMARs would be issued before test events using sensors on the MLP. Therefore, commercial marine vessels would have available transportation routes outside of the proposed test event areas.

Water use on the MLP would be as discussed in Section 4.1.8.2. No impacts to transportation and infrastructure from sensor test events onboard the MLP would be expected.

4.2.9 Water Resources Impacts

4.2.9.1 Missile Test Events

Pre-launch Activities Impacts

Towing the MLP would result in minor releases of diesel fuel to water from the tow vessel. Because marine transportation occurs regularly in the region, impacts from proposed activities would have no significant impact on water resources in PMRF. If liquid propellants were released into the ocean, the impacts would be as described in Section 4.1.9.1 and would not affect water quality.

Launch Activities Impacts

NASA has conducted evaluations of the effects of missile systems that are deposited in sea waters and concluded that no significant impacts would occur from launch activities. This discussion can be found in Section 4.1.5.1.

<u>Solid Propellant Missile.</u> Due to abundant equatorial precipitation throughout the year, ocean water near the equator tends to have lower salinity than that found in the mid-latitudes of the Pacific Ocean. As discussed in Section 4.1.9.1, more saline water environments would likely take longer for the perchlorate in the solid propellant to leach into the water. However, over time, the perchlorate would be diluted in the water and would not reach significant concentrations. (U.S. Army Space and Missile Defense Command, 2003b)

Post-launch Activities Impacts

Although washing the deck with freshwater following a launch may result in a temporary localized decrease in the salinity of the ocean water near the MLP, post-launch activities would not be expected to adversely impact water quality.

4.2.9.2 Sensor Test Events

Operational Activities Impacts

There is potential for localized impacts to water quality at PMRF from a diesel spill due to the use of generators; however, the potential for a spill is low. Any releases of hazardous materials into sea water would not be significant. Materials would be rapidly diluted and would not be found at concentrations that would produce adverse effects. No impacts to water resources would be expected from sensor test event operations.

4.3 Republic of the Marshall Islands USAKA/RTS

4.3.1 Air Quality Impacts

4.3.1.1 Missile Test Events

Pre-launch Activities Impacts

Total emissions generated during transportation of the MLP from the ordnance loading port to the launch location would be greater than those for test events occurring in the Western Range or PMRF since the distance traveled is greater; however, these emissions would be spread out over the entire travel distance and would be minimal. These emissions would be similar to those produced by other marine vessels in the vicinity of USAKA. The impacts from pre-launch activities of all missiles under consideration would not have a significant impact on air quality as described in Section 4.1.1.1.

Launch Activities Impacts

The proposed activities would not bring any new stationary emission sources to the USAKA and Wake Island area, therefore new permits or changes to existing air permits would not be required.

Emissions from launches would be as described in Section 4.1.1.1, and would be quickly dispersed in the near shore environment of USAKA due to the dominant trade winds, primarily the prevailing winds that blow east to northeast. Similarly at Wake Island, the strong easterly trade winds would disperse local emissions. Missile launches represent a small source of emissions in this region, and emissions from launches from the MLP would not be expected to adversely affect the near shore areas of USAKA and Wake Island. Air quality is considered good at both USAKA and Wake Island due to dispersion caused by the trade winds and lack of topographic features that inhibit dispersion. Air quality is well below the maximum pollutant levels established for air quality in the U.S, and launches would not significantly increase existing pollutant levels. Emissions from MLP missile launches would not be expected to adversely affect the near shore areas of USAKA and Wake Island.

Post-launch Activities Impacts

Transporting the MLP from test event locations in USAKA and Wake Island for any of the missiles under consideration could result in small amounts of localized vehicle emissions as described in Section 4.1.1.1, which would have a minor impacts on air quality. The prevailing trade winds would disperse any small emission amounts.

4.3.1.2 Sensor Test Events

Operational Activities Impacts

Emissions from the use of generators to support sensors on the MLP are discussed in Section 4.1.1.2. The use of a third generator for the sensor system in conjunction with the two 750-kilowatt generators would result in fewer emissions than those listed in Table 4-2, and therefore, minimal impacts on air quality would be expected.

Any emissions resulting from generator operations in support of sensor test events would be quickly dispersed in the near shore environment of USAKA and Wake Island due to the dominant trade winds. Emissions from sensor operations would not be expected to adversely affect the near shore areas of USAKA and Wake Island.

4.3.2 Airspace Impacts

4.3.2.1 Missile Test Events

Pre-launch Activities Impacts

Both USAKA and Wake Island and the surrounding areas are located in international airspace and therefore, the procedures of the ICAO are followed. ICAO Document 4444 is the equivalent air traffic control manual to the FAA Handbook 7110.65, *Air Traffic Control*. The airspace around USAKA and Wake Island is managed by Oakland ARTCC in its Ocean Control-5 Sector.

Four airways, between Hawaii and Australia and between the Far East and New Zealand, cross this area. These air routes are uncontrolled and frequency of operations in them is unknown. There is no airspace segregation method such as a warning or restricted area to ensure that the area would be cleared of nonparticipating aircraft; however, missile launches are short-term, discrete events. Test event sponsors would ensure coordination with the ICAO through the FAA, to issue International NOTAMs, locate ships with radar capable of monitoring the airspace, contact all commercial airlines and civil and private airports, and monitor appropriate radio frequencies to minimize potential safety impacts. Therefore, no significant impacts to airspace from pre-launch activities would result from missile test events onboard the MLP.

Launch Activities Impacts

All missile launches and missile intercepts would take place in international and uncontrolled airspace. Missiles would rapidly attain altitudes well above FL 600 and well above the airspace subject to Article 12 and Annex 11 of the ICAO Convention. Normal missile flights would not affect either air traffic control or other aircraft using en route airspace. Consequently, no impacts to airspace use would be expected.

The airways and jet routes that traverse the ocean area airspace in the ROI could be affected by the proposed action. However, missile launches would be conducted in coordination with the FAA and in compliance with DoD Directive 4540.1. Therefore, no significant impacts to over-water airways and jet routes would be expected.

Post-launch Activities Impacts

No impacts to regional airspace would be expected from post-launch activities for any of the missiles under consideration.

4.3.2.2 Sensor Test Events

Operational Activities Impacts

Airspace restrictions would be short-term events and would not pose a significant impact on available airspace. As discussed in Section 4.1.2.2 sufficient notice of restricted areas would be provided to allow pilots to select alternate flight paths to avoid the restricted areas.

Radar. Radar operations would be coordinated with FAA and USAKA Range officials and would be scheduled to occur during hours of minimal aircraft operations if possible.

The MLP would be located far enough off the coasts of USAKA and Wake Island that sensor tests from onboard would not be expected to interfere with any existing airfield or airport arrival and departure traffic flows.

4.3.3 Biological Resources Impacts

4.3.3.1 Missile Test Events

Pre-launch Activities Impacts

Transportation of the MLP from the ordnance loading port to the test event location in the area near USAKA and Wake Island would occur on routes currently used for similar maneuvers and would follow existing applicable regulations.

As discussed in Section 4.1.3.1, if whales or dolphins are observed in pre-launch surveys of the near shore launch safety zone or launch hazard zone, the launch could be delayed until the area is cleared. These precautions would reduce the probability of debris impact on cetaceans.

Launch Activities Impacts

As the distance from the shore increases, the density of marine species, including marine mammals, generally decreases and the corresponding probability of impact from activities associated with the proposed action decreases. The potential for impact exists when missiles associated with the proposed action fall into the ocean where they could impact a marine species.

Of particular concern is the potential for impacts to marine mammals from both auditory and non-auditory effects, which are discussed in Section 4.1.3.1.

The impact on marine resources should be minimal because of the relative infrequency of test events. The proposed action would not be expected to adversely affect the whales or whale habitat in the area. Noise from launch operations could startle whales, but this would be of short duration and would not result in long-term adverse impacts.

Because launches from the MLP would take place at some distance from the shore, test events would not be expected to impact nesting species of shorebirds on USAKA or Wake Island. Test events would not be expected to affect water quality or impact giant clams, mollusks, or sea grass.

Post-launch Activities Impacts

Debris impact and booster drops in the area near USAKA and Wake Island would be in the deep open ocean outside of the territorial waters of the Marshall Islands. The natural buffering capacity of sea water and the strong ocean currents would neutralize the reaction from any release of liquid propellants. Other post-launch activities, including washing down the deck, would not impact biological resources.

4.3.3.2 Sensor Test Events

Operational Activities Impacts

Because operational activities would take place in the ocean, there would be no impacts on near shore vegetation from the use of sensors onboard the MLP. There would be no adverse impacts on coral reefs, lagoons, or special or protected habitats located at USAKA and Wake Island from sensor test events.

Potential impacts to wildlife in the near shore environment would include seabirds, shorebirds, and migratory species striking the antennas, telescopes and shelters or becoming disoriented due to high intensity lighting at night. Migrating shorebirds, like the Pacific golden plover and ruddy turnstone, could be affected at USAKA, as well as the white tern and great crested tern. As described in Section 4.1.3.2, to minimize the occurrence of bird strikes, antennas would be raised only as necessary and have colorful streamers to increase visibility to birds. Because telescopes would not be raised to heights greater than a few feet, the occurrence of bird strikes would be infrequent. To reduce the likelihood that birds might become disoriented by the MLP's bright lighting, high intensity lighting would be used only during test events and low intensity lighting would be used whenever possible. Lighting would be adequate for safe working conditions but minimized to the extent practical.

Because use of sensors would occur onboard the MLP, marine wildlife found in the open ocean, including marine mammals and pelagic fish, would not be affected. Threatened and endangered species, such as giant clams, the Green sea turtle, the Loggerhead sea turtle, and the Pacific bottlenose dolphin, may occur in and around USAKA and Wake Island, but would not be adversely affected by operation of sensor systems on the MLP.

4.3.4 Geology and Soils Impacts

4.3.4.1 Missiles Test Events

Pre-launch Activities Impacts

Establishment of restricted areas and conducting evacuations would have no impact on geology and soils.

Launch Activities Impacts

Launch activities would be conducted at some distance from land and no impacts to geology and soils, including reef areas and beaches around USAKA or Wake Island, would be expected from the launch of missiles from the MLP.

Post-launch Activities Impacts

Debris from failed missions would likely sink to the ocean floor; however, they would be unlikely to impact geology and soils in the open ocean area.

4.3.4.2 Sensor Test Events

Operational Activities Impacts

Because operational activities for sensors would occur onboard the MLP, coral reefs, coastal sediment, and the ocean floor in and around USAKA and Wake Island would not be affected. Therefore, no impacts to geology and soils would be expected from the use of sensors on the MLP.

4.3.5 Hazardous Materials and Hazardous Waste Management Impacts

4.3.5.1 Missile Test Events

Pre-launch Activities Impacts

Hazardous materials and waste that may be used and generated by pre-launch activities are discussed in Section 4.1.5.1. No adverse impacts would be expected from pre-launch activities for missile test events from the MLP.

Launch Activities Impacts

NASA has conducted evaluations of the effects of missile systems that are deposited in sea waters, this discussion can be found in Section 4.1.5.1. No impacts would be expected from launch activities from the MLP.

Post-launch Activities Impacts

Post-launch activities would comply with U.S. Navy requirements for discharge of hazardous waste and the UNDS provisions of the Clean Water Act, which are discussed in Section 4.1.5.1.

Missile debris would most likely sink to the ocean floor at depths of thousands of meters. It is not anticipated that missile debris would be recovered from the deep-sea waters and thus there would be no collection of hazardous waste and no impacts associated with hazardous waste management activities.

4.3.5.2 Sensor Test Events

Operational Activities Impacts

All hazardous materials used and hazardous waste generated during operational activities would be handled in accordance with applicable Federal, state, and local regulations, including USAKA operating procedures.

Section 4.1.5.2 discusses the handling of diesel fuel and used petroleum, oil, and lubricants; compliance with U.S. Navy requirements for discharge of hazardous waste and the UNDS provisions of the Clean Water Act; and spill prevention. No impacts would be expected from sensor test events onboard the MLP.

4.3.6 Health and Safety Impacts

4.3.6.1 Missile Test Events

Pre-launch Activities Impacts

All operations at USAKA and Wake Island would require approval from the USAKA/RTS Safety Office. Procedures in the range areas would be conducted in accordance with the USAKA Range Safety Manual. In the event of a catastrophic event involving Wake Island, Operations Plan 355-1, Wake Island Disaster Preparedness Plan, would be implemented. As described in Section 4.1.6.1, no impacts to health and safety would be expected from missile test events from the MLP.

Launch Activities Impacts

Activities to ensure that health and safety precautions are taken during the planning and execution of test activities are discussed in Section 4.1.6.1.

For missions using USAKA and/or Wake Island all flight corridors would be over open sea waters, and debris footprints would not include any land areas. (U.S. Army Space and Strategic Defense Command, 1994b) There is only a very small probability of debris impacting at any point along this corridor, and there is only limited occupancy of the area around USAKA and Wake Island by marine traffic. Because of the remote possibility of debris impacting a vessel, safety impacts would not be significant for any category of missile under consideration.

Post-launch Activities Impacts

Post-launch activities would not be expected to pose any impact to health and safety.

4.3.6.2 Sensor Test Events

Operational Activities Impacts

All operations at USAKA and Wake Island would require approval from the USAKA/RTS Safety Office. Procedures for both ranges would be conducted in accordance with the USAKA Range Safety Manual. In the event of a catastrophic event involving Wake Island, Operations Plan 355-1, Wake Island Disaster Preparedness Plan, would be implemented. As discussed in Section 4.1.6.2, no impacts to health and safety would be expected from sensor test event operations from the MLP.

4.3.7 Noise Impacts

4.3.7.1 Missile Test Events

Pre-launch Activities Impacts

Pre-launch activities would be as discussed in Section 4.1.7.1 and would not be expected to pose a significant noise impact to the surrounding environment.

Launch Activities Impacts

Discussions of personnel safety, public safety, and public annoyance issues, as well as potential auditory effects, sonic booms, and noise level thresholds of impact to marine life can be found in Section 4.1.7.1. No significant impacts would be expected to biological resources in the USAKA range from missile launch noise from the MLP.

Post-launch Activities Impacts

Noise impacts from post-launch operations would be as discussed in Section 4.1.7.1 and would not be expected to have an impact on noise levels in the USAKA range.

4.3.7.2 Sensor Test Events

Operational Activities Impacts

Operation of the two 750-kilowatt generators on the MLP could be expected to have peak noise levels of 96 dBA and attenuate to 80 to 89 dBA at 15 meters (50 feet) from the source, as discussed in Section 4.1.7.2. Sensor operations would not be expected to have significant noise impacts in the USAKA range.

4.3.8 Transportation and Infrastructure Impacts

4.3.8.1 Missile Test Events

Pre-launch Activities Impacts

Transportation of missiles and propellants to the ordnance loading port would be conducted via road, rail, or air transport, as discussed in Section 4.1.8.1.

Because missile launches occur regularly from USAKA and because ocean vessels are already notified of such events as they are scheduled, the impact of missile launches on marine traffic would be negligible. Any disruption would be of short duration and would not be expected to have a significant impact on transportation.

Launch Activities Impacts

As described in Section 4.1.8.1, before a missile launch, Range Safety officials at USAKA would issue NOTAMs and NOTMARs, which would identify areas to avoid and the times that avoidance of the area is advised.

Marine vessels that might be found in the waters around USAKA and Wake Island include catamaran ferries, barges, landing craft mechanized and utility vessels, and smaller passenger boats. Because test events would occur away from the land areas no adverse impacts on marine traffic between the islands of USAKA and Wake Island would be expected.

Post-launch Activities Impacts

Post-launch activities, including washing the deck and other cleanup and maintenance activities, would not be expected to have an impact on transportation and infrastructure.

4.3.8.2 Sensor Test Events

Operational Activities Impacts

Marine vessels that are found in the waters around USAKA and Wake Island include barges, catamaran ferries, landing craft mechanized and utility vessels, and smaller passenger boats. Water usage would be as discussed in Section 4.1.8.2. Because test events would occur away from land areas, there would be no adverse impacts on marine traffic between the islands of USAKA and Wake Island.

4.3.9 Water Resources Impacts

4.3.9.1 Missile Test Events

Pre-launch Activities Impacts

Normal operations associated with towing of the MLP would result in minor releases of diesel fuel to water from the tow vessel. No significant impacts from pre-launch activities would occur because marine transportation occurs regularly in the region. If liquid propellants were released into the ocean, the impacts would be as described in Section 4.1.9.1 and would not affect water quality.

Launch Activities Impacts

NASA has conducted evaluations of the effects of missile systems that are deposited in sea water. This discussion can be found in Section 4.1.5.1. No impacts would be expected to water resources from missile test event launch activities

Solid Propellant Missile. Due to abundant equatorial precipitation throughout the year, ocean water near the equator tends to have lower salinity than that found in the mid-latitudes of the Pacific Ocean. As discussed in Section 4.1.9.1, more saline water environments would likely take longer for the perchlorate in the solid propellant to leach into the water. However, over time, the perchlorate would be diluted in the water and would not reach significant concentrations. (U.S. Army Space and Missile Defense Command, 2003b)

Post-launch Activities Impacts

Although washing the deck with freshwater following a launch may result in a temporary localized decrease in the salinity of the ocean water near the MLP, post-launch activities would not be expected to adversely impact water quality.

4.3.9.2 Sensor Test Events

Operational Activities Impacts

There is potential for impacts to water quality from a diesel spill due to operation of the generators; however, the potential for a spill is low. Any releases of hazardous materials into sea water would not be significant because the prevailing trade winds and the absence of large landmasses and continents support the mixing of the water in the near shore and lagoon waters around USAKA and Wake Island. The combination of these factors would prevent water quality deterioration. Materials would be rapidly diluted and would not be found at concentrations identified as producing any adverse effects. Because the ocean depth in the vicinity of the test event would be thousands of meters, any impact from spilled fuel would be expected to be minimal.

4.4 Broad Ocean Area

4.4.1 Air Quality Impacts

4.4.1.1 Missile Test Events

Pre-launch Activities Impacts

The impacts from pre-launch activities for all missile types would not have a significant impact on air quality as described in Section 4.1.1.1.

Launch Activities Impacts

Emissions from launches would be as described in Section 4.1.1.1, and would not be expected to adversely affect air quality in the BOA. Dispersion in the Pacific BOA is considered good due to prevailing trade winds and lack of topographic features that inhibit dispersion. This would support the dispersion of launch emissions.

Clean Air Act air permitting requirements do not apply to the BOA and therefore would not be affected by the proposed test events.

Post-launch Activities Impacts

Transporting the MLP from the test event locations in the BOA for any of the missiles under consideration would result in small amounts of localized vehicle emissions as described in Section 4.1.1.1, which would have a minor impact on air quality. The winds in the BOA would disperse any small emission amounts.

4.4.1.2 Sensor Test Events

Operational Activities Impacts

Emissions from the use of generators to support sensors on the MLP for test events are discussed in Section 4.1.1.2. The use of a third generator for the sensor system in conjunction with the two 750-kilowatt generators would result in fewer emissions than those listed in Table 4-2, and therefore, minimal impacts on air quality would be expected. Any emissions resulting from generator operations would be quickly dispersed in the BOA due to the prevailing winds that blow predominantly from east to west. Air quality over the Pacific Ocean is considered good due to dispersion caused by the trade winds and lack of topographic features that inhibit dispersion although no sources of ambient air quality monitoring data are known to exist. There are no major sources of air pollution. Emissions from operation of the sensor system would not adversely affect air quality in the BOA.

4.4.2 Airspace Impacts

4.4.2.1 Missile Test Events

Pre-launch Activities Impacts

The airspace in the BOA is in international airspace. As described in Section 3, procedures of the ICAO are followed; the FAA acts as the U.S. agent for aeronautical information to the ICAO. Air traffic in the BOA is managed by the Honolulu and Oakland ARTCCs.

Pre-launch activities for any missile under consideration would not have any adverse impacts on airspace in the region. Depending on the portion of the BOA used during the test event, if any low-altitude airways and/or high-altitude jet routes would be affected by proposed test activities, aircraft would be notified of any necessary rerouting before departing their originating airport and therefore would be able to take on additional fuel before takeoff. Routing around proposed debris areas would be handled in a manner similar to severe weather. The additional time for commercial aircraft to avoid the area would generally be less than 10 minutes at cruising altitudes and speeds.

Launch Activities Impacts

Establishing restricted areas would marginally reduce the amount of navigable airspace in the Pacific BOA, but because the airspace is not heavily used the impacts to controlled and uncontrolled airspace would be minimal. If possible, the MLP would be positioned to avoid the en route and jet routes that cross the North Pacific Ocean. Therefore, no significant impacts to the over-water airways and jet routes would be expected from any type of missile launched from the MLP.

Post-launch Activities Impacts

No post-launch impacts are expected to occur from the release of restricted airspaces and warning areas to normal non-hazardous use. Therefore, no impacts to regional airspace would be expected from post-launch activities related to any of the missiles under consideration for launch from the MLP.

4.4.2.2 Sensor Test Events

Operational Activities Impacts

The Honolulu or Oakland ARTCC would manage air traffic in the Pacific BOA, and coordination with the appropriate ARTCC would occur to designate restricted areas and warning areas for test events. During test events, at least one of the nine CAE corridors in the Pacific BOA would remain available for use by general aviation and commercial air carriers. No impacts would be expected to airspace from sensor test events onboard the MLP.

4.4.3 Biological Resources Impacts

4.4.3.1 Missile Test Events

Pre-launch Activities Impacts

Transportation of the MLP from the ordnance loading port to the test event location would occur on routes currently used for similar maneuvers and would meet applicable regulations.

As discussed in Section 4.1.3.1, if whales or dolphins are observed in pre-launch surveys, the launch would be delayed until the area is cleared. These precautions would reduce the probability of debris impact on marine mammals. No impacts to biological resources would be anticipated.

Launch Activities Impacts

The Pacific BOA includes open ocean communities composed of plankton (floating plant-like organisms) and nekton (free-swimming animals such as fish and squid) that could potentially be affected by launches. These open ocean organisms typically do not come near land, continental shelves, or the seabed. The potential for impact exists when missiles associated with the proposed action fall into the ocean where they could impact a marine species. The density of marine species including marine mammals generally decreases, and the corresponding probability of impact from activities onboard the MLP decreases, as the distance from the shore increases. Of particular concern is the potential for impacts to marine mammals from both auditory and non-auditory effects, which are discussed in Section 4.1.3.1. No significant impacts would be expected to biological resources from noise associated with missile test launches from the MLP.

Post-launch Activities Impacts

Proposed test events occurring in the Pacific BOA would take place at sites in the open ocean. Therefore debris impact and booster drops in the Pacific BOA would be well outside of the Exclusive Economic Zone. The natural buffering capacity of sea water and the strong ocean currents would neutralize any released liquid propellants. Other post-launch activities including washing down the deck would not impact biological resources.

4.4.3.2 Sensor Test Events

Operational Activities Impacts

Because operational activities would take place in the open ocean, there would be no impacts on near shore vegetation from use of sensors on the MLP. There would be no adverse impacts on open ocean communities of plankton and nekton, including deep-sea communities, or marine mammals and pelagic fish found in the Pacific BOA due to sensor operations.

4.4.4 Geology and Soils Impacts

4.4.4.1 Missile Test Events

Pre-launch, Launch and Post-launch Activities Impacts

No impacts to geology and soils would be expected from any missile test events from onboard the MLP as discussed in Section 4.1.4.1.

4.4.4.2 Sensor Test Events

Operational Activities Impacts

Because operational activities for sensors would occur onboard the MLP, ocean sediments and the ocean floor of the Pacific BOA would not be affected. Therefore, no impacts to geology and soils would be expected from the use of sensors on the MLP.

4.4.5 Hazardous Materials and Hazardous Waste Management Impacts

4.4.5.1 Missile Test Events

Pre-launch, Launch and Post-launch Activities Impacts

Hazardous materials that may be used and hazardous waste generated during pre-launch, launch, or discharges or debris from post-launch activities are discussed in Section 4.1.5.1. No hazardous waste management impacts associated with any of these activities would be expected.

4.4.5.2 Sensor Test Events

Operational Activities Impacts

All hazardous materials used and hazardous waste generated during sensor operation activities would be handled in accordance with applicable Federal, state, and local regulations.

Section 4.1.5.2 discusses the handling of diesel fuel and used petroleum, oil, and lubricants; compliance with U.S. Navy requirements for discharge of hazardous waste and the UNDS provisions of the Clean Water Act; and spill prevention. No impacts would be expected from sensor operations onboard the MLP.

4.4.6 Health and Safety Impacts

4.4.6.1 Missile Test Events

Pre-launch and Post-launch Activities Impacts

Test events in the BOA would take place thousands of kilometers away from populated areas; consequently, no adverse impacts to public health and safety would be expected.

Launch Activities Impacts

Because launch activities from the MLP would not take place close to any landmass, members of the public would not be exposed to hazards. Activities to ensure that health and safety precautions are taken during the planning and execution of test activities are discussed in Section 4.1.6.1.

Procedures for operations in the Pacific BOA would be conducted in accordance with DoD Directive 4540.1, *Use of Airspace by U.S. Military Aircrafts and Firing Over the High Seas*. Activities would be coordinated with the U.S. Coast Guard Pacific Area Districts 11 (California), 14 (Hawaii), and 17 (Alaska), which serve the Pacific Ocean ROI. The WorldWide Navigational Warning System would broadcast warnings about potential military hazards for test events to mariners in the Pacific BOA.

For missions in the Pacific BOA, all flight corridors would be over the open sea and debris footprints would not include any land areas. Because of the remote possibility of debris impacting a vessel, safety impacts of flight termination would not be significant.

4.4.6.2 Sensor Test Events

Operational Activities Impacts

Operation of sensors in the Pacific BOA would be conducted in accordance with the directives and requirements discussed above. As discussed in Section 4.1.6.2, no impacts to health and safety would be expected from sensor test operations from the MLP.

4.4.7 Noise Impacts

4.4.7.1 Missile Test Events

Pre-launch, Launch and Post-launch Activities Impacts

No noise impacts from pre-launch, launch, or post-launch activities from the MLP would be expected on humans or marine mammals in the BOA. See Section 4.1.7.1 for noise impact discussions.

4.4.7.2 Sensor Test Events

Operational Activities Impacts

Operation of the two 750-kilowatt generators on the MLP could be expected to have peak noise levels of 96 dBA and attenuate to 80 to 89 dBA at 15 meters (50 feet) from the source as discussed in Section 4.1.7.2. Sensor operations would not be expected to have significant noise impacts in the BOA.

4.4.8 Transportation and Infrastructure Impacts

4.4.8.1 Missile Test Events

Pre-launch Activities Impacts

Transportation of missiles and propellants to the ordnance loading location would be conducted via road, rail, or air transport, as discussed in Section 4.1.8.1. Any disruption to marine or air traffic would be of short duration and would not be expected to have a significant impact on transportation.

Launch Activities Impacts

Missile launch activities have the potential for intercept and target debris impacts to waters normally occupied by commercial shipping. The majority of international trade crossing the Pacific between Asia and North America uses routes of least distance, usually via the great circle route. Depending upon the individual flight path and mission scenarios, the actual debris impact area would be small. Prior warning of proposed launch activities would enable commercial shipping to follow alternative routes away from the proposed test area. The process is simplified by the lack of any formal shipping lanes in the northern Pacific Ocean. Safety procedures would be employed to determine that the impact areas are clear of surface vessels to ensure that no impact to ocean transportation would occur.

Post-launch Activities Impacts

Post-launch activities, including washing the deck and other clean up and maintenance activities, would not be expected to have an impact on transportation.

4.4.8.2 Sensor Test Events

Operational Activities Impacts

A large portion of U.S. trade in raw materials and finished products is carried through the northern Pacific Ocean to the large trading ports of Asia. The northern Pacific is an important commercial seaway, but no regulations or directives exist that require commercial vessels to use specific cross-ocean lanes. Commercial marine vessels would be able to choose transportation routes outside of the proposed test event areas. No adverse impacts on marine shipping or transportation in the Pacific BOA would be anticipated.

4.4.9 Water Resources Impacts

4.4.9.1 Missile Test Events

Pre-launch Activities Impacts

Towing of the MLP would result in minor releases of diesel fuel to water from the tow vessel, however because marine transportation occurs regularly in the region, impacts from proposed activities would have no significant impact on water resources. If liquid propellant were released into the ocean, the impacts would be as described in Section 4.1.5.1 and would not affect water quality.

Launch Activities Impacts

NASA has conducted evaluations of the effects of missile systems that are deposited in sea waters. This discussion can be found in Section 4.1.5.1. No impacts would be expected on water resources from missile launch activities.

Post-launch Activities Impacts

Although washing the deck with freshwater following a launch may result in a temporary localized decrease in the salinity of the ocean water near the MLP, post-launch activities would not be expected to adversely impact water quality.

4.4.9.2 Sensor Test Events

Operational Activities Impacts

The Pacific Ocean waters have high dissolved oxygen levels and low concentrations of suspended matter and contaminants, such as trace metals and hydrocarbons. There is a limited potential for impacts to water quality from a diesel spill during operation of the generators. Any releases of hazardous materials into sea water would not be significant and would likely be dispersed quickly due to the prevailing trade winds and absence of large landmasses and continents. Materials would be rapidly diluted and would not be found at concentrations identified as producing any adverse effects. Because the ocean depth in the vicinity of the test event location would be thousands of meters (feet), any impact from the fuel would be expected to be minimal.

4.5 Cumulative Impacts

Because the proposed activities would take place in the open ocean, no major differences are expected to the cumulative impacts between ranges.

Missile Test Events

There are no known other activities in the near shore environment or BOA that would contribute to cumulative impacts in the open ocean, therefore this cumulative impacts analysis focuses on the cumulative impacts of up to four test events per year. Proposed missile launches from the MLP in conjunction with other existing or planned activities would not be expected to produce cumulative impacts.

Air Quality. No exceedances of air quality standards or health-based standards of non-criteria pollutants are anticipated. Missile launches are short-term, discrete events, thus allowing time between launches for emissions products to be dispersed.

Airspace. Appropriate NOTAMs would be issued before launches. The volume of air traffic utilizing the open ocean environment is within structured airspace with scheduling procedures in place for jet routes, and warning and control areas.

Biological Resources. The low speed of the MLP would preclude it from colliding with marine mammals. Noise impacts may elicit behavioral disturbance responses in wildlife, however the addition of at most four missile-launches per year would have no cumulative effects. Use of spill prevention, containment, and control measures would prevent or minimize impacts to biological resources from spills of propellants.

Geology and Soils. Since no direct geologic impacts would result from the proposed activities, there would be no cumulative geologic effects because of the very low number and very low frequency of proposed launches.

Hazardous Materials and Hazardous Waste. The increased hazardous materials used and waste generated during proposed launches from the MLP would be managed in accordance with applicable Federal, state and maritime regulations, and DoD service guidelines. This would preclude the potential for additive cumulative impacts to hazardous materials and waste management practices with the open ocean area.

Health and Safety. The increased missile launches and transport of potentially hazardous materials for some operations would represent a small increase in the use of hazardous materials in the open ocean area. Fueling operations for pre-fueled and solid propellant missiles would take place before the missile is placed on the MLP. Existing transportation and handling procedures would serve to keep safety impacts within acceptable levels and thus would have no cumulative impacts to health and safety.

Noise. The deck of the MLP would be hardened to protect personnel during launch operations and personnel would be required to wear appropriate hearing protection.

Missile launches would be short-duration activities and similar to activities already occurring in the area and thus would have no cumulative impacts to the surrounding area.

Transportation and Infrastructure. Appropriate NOTMARs would be issued before launches allowing marine transportation to avoid launch hazard areas. Because missile launches occur regularly in the area, and because vessels are already notified of these launches, the small increase in proposed missile launches would have no cumulative effect on marine transportation.

Water Resources. Proposed launch activities would take place in deep areas of the Pacific Ocean, therefore any propellant spills or launch emissions would be diluted in water and no cumulative impacts would be expected.

Sensor Test Events

There are no known other activities in the near shore environment that would contribute to cumulative impacts in the open ocean, therefore this analysis focuses on the cumulative impacts of up to four test events per year. Proposed use of sensors on the MLP with other activities would not be expected to produce cumulative impacts. In instances where two radars are used together, for example if the Mk-74 is given a vector to track a target by another radar, such as the TPS-X, no additional impacts would be expected since Mk-74 support equipment would be powered by the generators on the MLP and would not require supplemental power generators. Therefore, the impacts from using two sensors on the MLP would be similar to those outlined below.

Air Quality. No exceedances of air quality standards or health-based standards of non-criteria pollutants would be expected. Operational emissions sources would include generators and maintenance activities. These emissions would be quickly dispersed and would have no cumulative impacts in the open ocean environment.

Airspace. The airspace in the open ocean environment is structured airspace with scheduling procedures in place for jet routes, and warning and control areas. Sensor operating areas would be restricted to minimize impacts to aircraft operations. Standards developed by the FAA and DoD, which limit EMR interference to aircraft, would preclude the potential for cumulative impacts to airspace.

Biological Resources. The low speed of the MLP would preclude it from colliding with free-swimming marine mammals therefore there would be no cumulative impacts to biological resources in the open ocean.

Geology and Soils. Since no direct geologic impacts would result from the proposed activities, there would be no cumulative geologic effects because of the very low frequency of proposed sensor test events.

Hazardous Materials and Hazardous Waste. The increased hazardous materials used and waste generated during sensor test events from the MLP would be managed in accordance with applicable Federal, state and maritime regulations, and DoD service guidelines. This would preclude the potential for additive cumulative impacts to hazardous materials and waste management practices with the open ocean area.

Health and Safety. EMR hazard zones and safety procedures would be established to provide safety to personnel aboard the MLP. The MLP would be located far enough from land to preclude exposure to the public; therefore, there would be no cumulative impacts to health and safety.

Noise. Operational noise would be limited to power generators supporting on-board MLP systems and a generator to power the sensor systems. Noise impacts would not be different from current marine vessels, and thus there would be no cumulative noise impacts.

Transportation and Infrastructure. Appropriate NOTMARs would be issued before test events using sensors allowing marine transportation to avoid test event locations. Because vessels would be notified before a test event using sensors and would be able to choose transportation routes outside of proposed test event areas, the small increase in proposed missile launches would have no cumulative effects on marine traffic.

Water Resources. Proposed launch activities would take place in deep areas of the Pacific Ocean, therefore any releases of diesel would be diluted in the sea and no cumulative impacts would be expected.

4.6 Mare Island

As indicated previously, there would be no changes required to Mare Island to support docking, servicing, or maintaining the MLP. In addition, any impacts resulting from generator use onboard the MLP would not be different than vessels currently using the port, thus no significant impacts would be expected from the use of the MLP at Mare Island. Radars on the MLP would radiate at the home port for system testing, calibration, and tracking of satellites. The radar would operate at full power for approximately four hours per week for calibration purposes when not supporting a test event. Under proposed operating conditions, calibration and maintenance testing for radars while at the home port would involve the beam being pointed up and constantly moving. In addition, any side lobes that may reach the ground would be far removed from the main beam and would not contain sufficient energy to present any type of radio frequency emission hazard. At X-band frequencies (8,000 megahertz to 12,000 megahertz), the IEEE standard for human exposure is 5.33 megawatt per square centimeter to 8 megawatt per square centimeter. In order for radars to have an effect on human health, the beam operating at full power would have to come in contact with a person and remain focused on them for 7.5 minutes (at 8,000 megahertz) or 11.25 minutes (at 12,000 megahertz). With the implementation of software controls, there would be no radiation hazard area on the shore at the home port. Thus, no impacts would be expected to the home port from using radars on the MLP

4.7 Specific Test Events

Six proposed tests using the MLP have been identified by the MDA and are in various stages of planning as described in Section 2.3. Table 4-3 describes the proposed test, location, activities and associated environmental analysis. If a portion of the activity is not considered in this EA, then the document in which the activity is considered is listed.

Table 4-3. Specific Proposed Test using the MLP

<table>
<tr><th>Proposed Test</th><th>Proposed Location</th><th>Proposed Activities</th><th>Location of Analysis</th></tr>
<tr><td rowspan="2">Arrow Weapons System Test</td><td rowspan="2">Western Range</td><td>Non-pre-fueled liquid propellant target launched from MLP in Western Range</td><td>Section 4.1</td></tr>
<tr><td>Interceptor launch from San Nicolas Island</td><td>Point Mugu EIS/Overseas EIS
Theater Missile Defense Extended Test Range EIS</td></tr>
<tr><td>IFT</td><td>BOA</td><td>TPS-X and TTS on the MLP to collect data for IFT</td><td>Section 4.4</td></tr>
<tr><td>Critical Measurement Program Test</td><td>PMRF</td><td>Launch of targets from MLP from north of PMRF
No intercept attempt</td><td>Section 4.2</td></tr>
<tr><td rowspan="2">PAC-3 Weapons System Test</td><td rowspan="2">Western Range</td><td>Target launched from Vandenberg AFB</td><td>Theater Missile Defense Extended Test Range EIS
Targets Programmatic EA</td></tr>
<tr><td>Interceptor launch from MLP in Western Range</td><td>Section 4.1</td></tr>
<tr><td rowspan="2">THAAD Test</td><td rowspan="2">PMRF</td><td>Launch target from MLP within PMRF range</td><td>Section 4.2</td></tr>
<tr><td>Includes intercept by THAAD launched from PMRF</td><td>PMRF Enhanced Capability EIS
THAAD Pacific Flight Test EA</td></tr>
<tr><td>TTS Test</td><td>BOA</td><td>Two tests using TTS to collect missile data</td><td>Section 4.4</td></tr>
</table>

4.8 No Action Alternative

Under the no action alternative, activities to be conducted from the MLP that have already been analyzed would continue and additional activities using the MLP would be considered on a case-by-case basis. The potential benefits to the testing program from implementing realistic fight-test scenarios and the greater flexibility afforded with a mobile platform would not be realized. If the no action alternative were selected, there would be no change in environmental impacts associated with the proposed activities to be conducted from the MLP. Current test activities would continue at the ranges.

4.9 Alternative 1

As described in Section 2.7, Alternative 1 considers using the MLP for the launch of all missile types (pre-fueled and non-pre-fueled liquid propellant target missiles, solid propellant target missiles, and solid interceptor missiles) but not for testing sensors. The impacts expected from Alternative 1 would include those impacts described for pre-fueled and non-pre-fueled liquid propellant and solid propellant missiles. Therefore, the impacts from Alternative 1 would be less than those impacts described for the proposed action.

4.10 Alternative 2

As described in Section 2.7, Alternative 2 considers using the MLP for testing sensors and launching pre-fueled liquid and solid propellant missiles but not non-pre-fueled liquid propellant missiles. The impacts expected from Alternative 2 would include those impacts described for sensors and pre-fueled liquid and solid propellant missiles. Therefore, the impacts from Alternative 2 would be less than those described for the proposed action.

4.11 Adverse Environmental Effects that Cannot be Avoided

Adverse environmental effects that cannot be avoided include minor short-term impacts to and startling of wildlife and minor increased generation of hazardous materials. Pollutants would also be released to the atmosphere through generation of power and missile exhaust. Any hazardous wastes generated would be managed in compliance with DoD, U.S. Navy, and other applicable Federal, state, and local regulations. EMR levels would not exceed safety guidance and would not affect the public.

4.12 Irreversible or Irretrievable Commitment of Resources

The proposed action is not expected to result in the loss of or impact to threatened or endangered species. The amount of raw materials required for any program-related activities would be small. Although the proposed activities would result in some irreversible or irretrievable commitment of resources, such as raw materials or labor required for proposed test events, this commitment of resources is not significantly different from that necessary for other defense research and development programs carried out over the past several years. Proposed activities would not irreversibly curtail the range of potential users of the environment. Proposed activities would not commit natural resources in significant quantities.

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